Introduction to the

JOHNSON VIKING MODEL 122 Variable Frequency Oscillator Assembly, calibrating, and Operating Instructions

Good workmanship and careful adherence to instructions are necessary in the building and operating of the Model 122 Variable Frequency Oscillator. Although the design of this VFO was carried out with the objective of reducing the number of critical circuits to a minimum and making assembly simple, the capacitor and inductor values of the tuned circuit components were necessarily chosen with a given parts layout; therefore, the builder should duplicate the layout shown in the illustrations and described in the text. Circuits should be checked against the schematic diagram during the several steps of assembly. Much time and effort may be saved by finding an error or deviation from the illustrated layout before the unit is completed.

The accuracy of frequency adjustments will be largely determined by the amateur's requirement and the standard he has available. The calibrating instructions should be understood before attempting to make initial frequency adjustments. After the frequency setting adjustments have been completed to the satisfaction of the user, there is little reason to expect much change with time; however, it is always wise to check the frequency calibration periodically if the VFO dial scale is depended upon for determining the frequency of the transmitter.

The Viking Model 122 VFO has only two controls. A little care in noting the position of the Bandswitch and the Tuning dial before completing transmitter tuning will assure the operator of a correct frequency indication. The operating instructions are very simple but important. Be certain they are understood before using the VFO.

WARNING

The Viking Model 122 VFO derives its power from the transmitter low voltage power supply or an auxiliary supply. The B+ source to the VFO must be off to remove the 250 to 300 volts from the VFO. The "plt off" position of the bandswitch does open the screen and plate circuits of the oscillator tube but the high voltage exists on other components.

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A. Assembly Instructions

1. Bottom chassis assembly. Do not solder any connections until instructed to do so. Refer to Figure 1a.

    a. Mount X50, miniature 6AU6 oscillator socket. Use 3/16" 4-40 screws, inserting screw from the bottom of the chassis and securing the screw with a 4-40 nut over the socket shell lip above the chassis. Place a #4 shakeproof washer under each screw head and a #6 teardrop solder terminal under the mounting screw near the front of the chassis for ground connection. Pin 7 should be toward the rear of the chassis.

    b. Mount X51, miniature OA2 regulator socket, as above, the #6 solder terminal toward the front and socket pin 7 toward the rear of the chassis.

    c. Mount X52, five terminal strip. Use 1/4" 6-32 binding head screws with a single #6 solder terminal, and a #6 shakeproof washer under the front nut, and one #6 solder terminal, two #6 solder lugs (with wings), and a shakeproof washer under the rear nut.

    d. Mount J50, type A2A key jack, in the middle hole on the rear of the chassis, using only a single 3/8"-32 nut with no washer.

    e. Using a stripped piece of black #20 wire, connect the center shield, pin 2, and pin 3 to the #6 teardrop terminal under the mounting screw of the 6AU6 socket X50.

    f. Connect the center shield and pin 2 of the OA2 socket, X51, to the teardrop terminal under its mounting screw using the #20 stripped wire.

    g. Connect the 1/2 watt 47,000 ohm resistor R50 between pins 1 and 2 of the 6AU6 socket X50.

    h. Connect a .005 mfd. condenser C70 between pins 6 and 2 of the 6AU6 socket X50.

    i. Connect the 470 ohm 1/2 watt resistor R53 between the first and second terminals from the front on terminal strip X52.

    j. Connect a .005 mfd. condenser C68 between the #6 teardrop terminal under the front mounting nut and the second terminal from the front of X52.

    k. Connect the 4700 ohm 1/2 watt resistor R52 between the third and fourth terminals from the front of X52.

    l. Connect a 150 mmfd. NPO ceramic condenser C67 (bk-bn-gn-bn-or) between the rear and the second terminal from the rear of X52.

    m. Connect the 22,000 ohm 1/2 watt resistor R54 between the rear terminal of X52 and one of the #6 teardrop terminals under the rear mounting nut of X52.

    n. Mount the switch mounting bracket BKT53 with the lip toward the rear of the chassis. Use 1/4" 6-32 binding head screws, #6 shakeproof washers, and 6-32 nuts.

✓ o. Place the switch SW50 on the bracket, guiding the shaft through the hole in the front of the chassis. Secure the switch to the bracket with the 3/8-32 nut and shakeproof washer furnished. The switch should be positioned so that the index ball will be on the right when the chassis is viewed from the bottom and front.

✓ p. Mount the output coil L51 over the hole provided near the middle of the chassis. The coil should be placed so that the tapped portion with the lesser number of turns is toward the chassis and the terminated pins are toward the rear of the chassis. Insert the 1-3/4" 6-32 screw from the top of the chassis, running it through the coil form and securing the coil form with the small rectangular piece BKT55, a #6 shakeproof washer and a 6-32 nut. Be careful to center the coil so that the 1-3/4" 6-32 screw does not touch the pins which project through the coil form.

✓ q. Using the #20 black plastic wire, connect the pin of the output coil near the chassis to pin 5 of the 6AU6 socket X50 and also to the second terminal from the rear of terminal strip X52. Solder all three terminals just connected.

✓ r. Looking at the bandswitch SW50 from the rear, call the top terminal to the left of the steatite wafer mounting screw number 1, the terminal in the counter clockwise direction number 2 and so on through 12. Using a piece of #20 black plastic wire connect terminal 12 of SW50 to the middle tap of the output coil L51. Solder the connections

✓ s. Connect terminal 11 of SW50 to the top pin of L51 and to the third terminal from the front of X52. Solder at the terminal strip only.

✓ t. Connect terminal 10 of SW50 to the second terminal from the front of the terminal strip X52. Solder both terminals.

✓ u. Connect terminals 5 and 7 of SW50, and connect terminal 5 of SW50 to pin 7 of the 6AU6 socket X50. Do not solder.

✓ v. Cut one lead of the 22 ohm 1/2 watt resistor R55 and one lead of the 43 mmfd. (bl-yl-or-bk-or) NPO condenser C66 to 3/8" lengths. Connect the 3/8" leads together by forming hooks on each, crimping the hooks together and soldering the hooked connection. Slip a 1" piece of black insulation (stripped from the #20 wire) over the free end of C66 and connect that end to terminal 2 of SW50. Connect the free end of R55 to pin 1 of the 6AU6 socket X50 after cutting the lead so that C66 and R55 can be placed directly in line between the tube socket and the switch terminal. Solder the two connections.

✓ w. Mount and connect the RF choke L52 between the tip terminal (insulated terminal at end of the jack) and switch SW50 terminal 5. Trim one RF choke lug to fit into the jack terminal and complete the connection to the switch terminal with a short piece of #20 wire between the other RF choke lug and switch terminal 5.

✓ x. Connect a .005 mfd. condenser C69 between the tip terminal and the grounded sleeve terminal of the keying jack J50. Solder both terminals on the jack, the RF choke lugs, and terminals 5 and 7 of SW50

y. Connect the 18,000 ohm 2 watt resistor R51 between terminal 11 of the bandswitch SW50 and pin 1 of the OA2 socket X51. Solder both terminals.

z. Using a piece of #20 black plastic covered wire, connect pin 5 of the OA2 socket X51 and pin 6 of the 6AU6 socket X50. Solder these connections and all other connections which have not been previously soldered except those on bandswitch SW50.

2. Condenser-terminal board assembly.

a. Refer to Figure 1b. Connect a .001 mfd. silver mica condenser C59 between pins 1 and 5 of the condenser-terminal board CH55. Note the board is oriented so that there are three trimmer condenser mounting holes on the right holes on the right side and two on the left side. Loop the condenser leads over the terminal pins as near the board as convenient to allow room for other connections on the outside of the pins.

b. Connect another .001 mfd. silver mica condenser C60 between pins 5 and 7 in the same manner as in step 2a and solder both condensers lightly to hold them in place.

c. Connect a .0005 mfd. silver mica condenser C56 between pins 4 and 6 as shown in Figure 1b in the same manner as in step 2a.

d. Connect another .0005 mfd. silver mica condenser C58 between pins 6 and 8 as in step 2a. Solder C57 and C58 leads lightly.

e. Turn the condenser-terminal board around to the position shown in Figure 1c. Mount the 40 meter padder condenser C54, the 15M11 miniature condenser whose rotor terminal is on the right side when the stator is up and viewed from the rear. Use the nut provided on the condenser bushing.

All following condenser descriptions are from the rear view of the condensers.

f. Mount the 40 meter trimmer C52, the 9M11 miniature condenser with the stator terminal on top and the rotor terminal to the right, in the same manner as C54 was mounted.

g. Mount the 11 meter adjusting trimmer C56, the 15M11 miniature condenser in the lower hole on the left side. The stator terminal should be down and the rotor terminal to the right.

h. Mount 160 meter padder C61, the 30M8 miniature condenser, in the upper right hole, with the stator terminal on top and the rotor terminal to the left.

i. Mount the 160 meter trimmer, C63, 15M11 miniature condenser, in the hole below C61, with the stator terminal on top and the rotor terminal to the left.

j. Mount the dual stator tuning condenser C55 in the middle of the board as shown in Figure 1c. The threaded bushing should be secured to the board with a 3/8 - 32 hex nut. The stator terminals are on top and the rotor terminal is below the condenser. Be careful not to subject the condenser to undue strain at the bushing by dropping the assembly or applying force to the shaft.

k. Attach two mounting brackets BKT52 to the front mounting posts of C55 using two 1/4" 6-32 screws and #6 shakeproof washers.

l. Strip a piece of the black plastic #20 wire and connect the rotor terminal of C52 to the rotor terminal of C56 and the rotor terminal of C56 to pin 8 of the terminal board.

m. Using #20 stripped wire, connect the rotor of C63 to pin 7 of the terminal board, connect pin 7 to the rotor terminal of the tuning condenser C55, and connect rotor terminal of C55 to pin 8 of the terminal board. Solder all connections of steps k and l, except the rotors of C63 and C52.

n. Mount and connect the fixed 47 mmfd, N220 negative temperature coefficient, ceramic condenser C51 (yel-yel-vlt-bk-or) between the rotor terminal of C52 and pin 3 of the terminal board. Keep the leads straight and taut.

o. Connect the 43 mmfd. NPO zero temperature coefficient, ceramic condenser C53 (bk-yel-or-bk-or) between the left stator terminal of C55 and pin 3 of the terminal board.

p. Connect the 91 mmfd., N080 negative temperature coefficient, ceramic condenser C64 (rd-wt-bn-bk-or) between the rotor terminal of C63 and pin 2 of the terminal board.

q. Connect the 140 mmfd., NPO zero temperature coefficient, ceramic condenser C62 (bk-bn-yel-bn-or) between the right stator terminal of the large tuning condenser C55 and pin 2 of the terminal board.

r. Using the stripped #20 wire, connect the stator of C52 to the stator of C54 and the stator of C54 to pin 3 of the terminal board. The wire should be formed to pass inside of the padder condenser C54 stator and clear the stator by at least 1/8 inch.

s. As in previous step r connect the stator of C63 to the stator of C61 and the stator of C61 to pin 2 of the terminal board.

t. Connect the rotor of C54 to the left stator terminal of C55 with a piece of stripped #20 wire.

u. Connect the rotor of C61 to the right stator terminal of C55. Solder all connections which have not been previously soldered on the front side of the condenser board.

v. Turn the condenser-terminal board around to the position shown in Figure 1b, strip the ends and attach the plastic covered connecting wires, soldering the connections as the leads are attached. Proceed in the following order:

1) a 3" black lead to pin 8 of the terminal board ✓
2) a 7" green lead to pin 1 ✓
3) a 6" red lead to pin 4 ✓
4) a 6" yellow lead to pin 5 ✓
5) a 5" brown lead to pin 6 ✓
6) a 6" grey lead to pin 3 ✓
7) a 4" blue lead to the stator terminal of C56 (Figure 1c) ✓

w. Twist the green and yellow leads together, training them downward and slightly to the right as shown in Figure 1b. Twist the red and brown leads together, training them downward slightly to the right.

x. Bring the blue lead around the mounting board and twist it with the black lead as shown in Figure 1b.

3. Top Chassis Assembly

a. Place a 9/16" OD rubber grommet in the 7/16" hole just behind the condenser mounting board position as shown in Figure 2a.

b. Position the condenser mounting board assembly and place all of the wires through the grommet as shown in Figure 2a.

c. Secure the condenser terminal board brackets and the front tuning condenser brackets to the chassis by means of 1/4" 6-32 screws, shakeproof wahsers and 6-32 nuts. Place a #6 teardrop solder terminal under the nut near the grommet on the bottom side of the chassis.

d. Place the 3/8-32 panel bearing through the large hole on the flat dial support bracket BKT54. Secure with a 3/8-32 nut. Position BKT54 by slipping the bearing, with the threaded end toward the rear, over the shaft of the tuning condenser C55. Secure BKT54 to the chassis with three 1/4" 6-32 screws, 6-32 nuts, and #6 shakeproof washers. Center the bracket and mounting board assembly and tighten all mounting screws and nuts.

e. Place the dual oscillator coil L50 on the chassis directly to the rear of the condenser mounting board. The leads of the coil should be toward the front of the chassis and the spade studs should fall into the diagonally located holes on the chassis. Secure the coil with 6-32 nuts and shakeproof washers.

f. Connect the leads of the coil to the pins of the condenser-terminal board as directly as possible while clearing other leads and pins. Make connections as follows:

1) Bottom lead of lower coil to pin 1 of condenser board. (Refer to Figures 1b and 2a). Solder.
2) Top lead of lower coil to pin 2. Solder.
3) Bottom lead of upper coil to pin 4. Solder.
4) Top lead of upper coil to pin 3. Solder.

g. Mount and secure the rear trimmer coupling support bracket BKT50 at the rear of the chassis in position so that the large holes are in line with the trimmer shafts. Secure with two 1/4" 6-32 screws, 6-32 nuts and shakeproof washer.

h. Place the coil cupport bracket BKT51 assembly over the coil form with the yoke butt pieces separated so the butt pieces will fall over the coil form edge. Secure the brackets with a 3/16" 4-40 screw through the condenser mounting board CH55 and a 3/16" 4-40 screw and #4 shakeproof washer through the trimmer coupling support bracket BKT50. A shakeproof washer is not necessary against the phenolic board.

i. Loosen the top screws on the coil support bracket BKT51 and force the butt pieces against the coil form. While holding these pieces against the coil form, tighten the top screws to secure the butt pieces firmly against the coil.

j. Install an insulated coupling shaft assembly D53 shown in Figure 2a by placing the phenolic shaft through the rear coupling support bracket with the deep slotted end toward the trimmer condenser shaft. Place the engaging spring in the deep slot with the bowed end toward the condenser shaft so that the spring engages the condenser shaft slot and is compressed until the slots on the phenolic shaft straddle the rear coupling support bracket. Force a "C" washer over the slot of the phenolic shaft on each side of the bracket. Use long nose pliers to force the "C" washers on and close the opening somewhat if the "C" washer has been spread enough to make it possible to drop off the shaft. Repeat the coupling shaft installation procedure for the remainder of the coupling shafts.

4. Bandswitch, Cable, and Plug connections.

a. Refer to Figure 1a. Cut, strip ends, and connect the wires from the condenser mounting board to the bandswitch SW50. Refer to 1r for SW50 terminal numbering. Complete connections as follows:

1) Green to terminal 1
2) Yellow to terminal 4
3) Red to terminal 3
4) Brown to terminal 6
5) Blue to terminal 8
6) Gray to terminal 9
7) Black to the terminal under the nut of the condenser board mounting screw.

Solder all connections on SW50 and the ground terminal

b. RG59U and PL259 cable and plug assembly, G50 and PL50. The length of the coax cable G50 must be left at the length supplies as it is electrically part of the broadly tuned output circuit.

1) Cut and remove 1-1/4" of outer vinyl cover from one end of the RG59U cable.

2) Push the UG176U adapter over the cable end with the threaded end first. Position the adapter to expose 1" of the copper braid beyond the adapter. If the adapter fits very tightly on the vinyl cover, reduce the diameter of the cover by filing or slicing the surface very thinly about 1/2" back with a sharp knife until the adapter slides over the cover.

3) With the thin lip of the adapter 1" from the end of the cable, whose vinyl covering has been removed, comb the braid wires and lay them back evenly over the adapter lip. Cut off the excess braid strand length 3/8" back so that the braid strands do not reach the adapter threads.

4) Holding the adapter in place, cut and remove 9/16" of polyethylene insulation from the end, exposing the inner conductor.

5) Turn the outer knurled cylinder off of the coaxial plug PL259. Pass the inner plug part over the end of the cable, guiding the inside of the plug pin over the inner conductor. Turn the plug to engage the adapter UG176U threads and tighten the two parts together with gas pliers and vise or other suitable tool.

6) Solder the inner part of the plug to the braid wires and adapter at the cutaway section holes. Use a hot iron and run in a small amount of solder through each hole, flowing the solder over the braid wires.

7) Solder the inner conductor to the tip of the pin and cut off the excess inner conductor.

8) Screw the outer PL259 cylinder over the plug inner piece.

c. Three conductor cable and octal connector assembly G51 and PL51.

(1) Remove the shell from the 8 prong plug PL51 by prying with a screw driver.

(2) Remove the outer covering and unbraid 1-1/2" of shield braid on one end of the 3/c cable. Divide the loose shield strands in two parts and twist the strands of each part together. Strip 1/2" of insulation off each of the three conductors.

Insert the twisted braid conductors in pins 1 and 2 of the plug, pull through the pins 1/4" and solder. Insert and solder each of the three conductors to pins of the plug, allowing each to extend 1/16" beyond the pin end as follows:

1) Black tracer to pin 8
2) White tracer to pin 7
3) Red tracer to pin 3
4) Trim excess wire off all pins when the connections to the pins have been completed.

Place the plug shell over the cable and secure it to the plug proper.

d. Place 9/16" rubber grommets in the two remaining 7/16" holes at the rear of the chassis.

e. Remove the outer cover and comb out the braid on 6" of the free end of the 3/c cable. Cut off all but 1" of the braid and twist the remaining part together tightly. Insert the free end of the cable through the rear inner 7/16" grommeted hole of the chassis, as shown in Figure 1a, and place the twisted braid wire in one of the #6 soldering lugs under the rear mounting nut of terminal strip X52. Crimp the lug over the shield wire and solder. The lug should be positioned to take the strain of the cable.

f. Cut to length and connect the black tracer lead to the transfer contact terminal of the key jack J50 (the rear terminal). Solder. Connect the white tracer lead to pin 4 of the 6AU6 socket X50. Solder. Connect the red tracer to the front terminal of X52. Solder.

g. Remove the vinyl cover and comb out 1 1/4" of shield braid on the unconnected end of the RG59U cable G50. Cut 1/2" off the braid wires and twist them together tightly. Remove 3/8" of polyethlene from the end of the cable exposing the inner conductor.

h. Insert the cable through the outer grommeted hole of the chassis as shown in Figure 1a and place the twisted shield wire in the remaining #6 soldering lug under the rear mounting screw of X52. Crimp and solder the lug to the shield wire. The lug should take most of the cable strain.

i. Connect the inner conductor of the RG59U to the rear terminal of the terminal strip X52. Solder.

5. Dial Drive Assembly D51. Refer to Figures 1a and 2a.

a. Place the bearing and shaft assembly through the remaining 7/16" hole in the front of the chassis, the long shaft end extending out and the bearing threads into the chassis. Fasten with a 3/8-32 nut.

b. With the hubs toward the chassis, push the friction drive wheel and the drive disc on the chassis shaft and tuning condenser C55 shaft at the same time. The large friction disc should be engaged by the twin drive wheel discs. Tighten the drive wheel setscrews in a position where the dial drive disc is not bent by the drive wheel when the outside of the drive disc dial mounting plate is even with the condenser shaft end. Tighten the drive disc set screws to the condenser shaft temporarily, paying no attention to its position relative to the condenser rotor.

c. Attach the calibrated dial plate to the mounting plate with the three short flat head 6-32 screws, orienting the dial so that the 7.425 and 1.75 mc markings are on the same side of the shaft as the setscrews on the dial drive disc hub.

d. Assemble the index plate to the front panel. Do this with care to prevent scratching the panel. Place the two flat head 4-40 screws through the holes near the upper part of the window opening. Place two #8 washers over each screw at the rear of the panel to serve as a spacer. Place the index plate over the screws with the index marker toward the front and bottom of the panel. Secure the index plate in its maximum upward position with two 4-40 nuts and lockwashers.

6. Preliminary tests and checkout.

a. Look over the entire completed assembly at this time, checking for unsoldered connections and loose nuts or screws. Make a thorough examination of all connections and check back on the assembly instructions if some connection appears to be incorrect.

✓ b. Plug in the 6AU6 and OA2 tubes in their respective sockets. Place a shield can over the 6AU6 tube. Make the following tests before the panel and cabinet are assembled.

c. Attach the VFO knobs to their shafts temporarily. Turn the bandswitch to the counter clockwise position (plt off).

d. Plug the power supply octal connector PL51 into the transmitter VFO supply socket or the socket on an auxiliary power supply. Turn on the transmitter low voltage or auxiliary power supply switch after making certain the "drive" control to the final tube of the transmitter is set at its minimum value. Check the lighting of the 6AU6 tube filament. The OA2 should have no glow.

e. Turn the bandswitch to the next position clockwise (160 80 40). The OA2 tube should now have a violet glow between its electrodes.

f. Attach a short antenna wire 1-1/2 to 2 feet long to the output coax plug PL50. Set up a receiver, whose calibration is correct within 25KC on the 160 meter band and 50KC on the 40 meter band, 5 to 25 feet from the VFO.

g. Turn all trimmers and padders to their half value position and set the main tuning condenser C55 so that the rotor plates are completely engaged with the smaller stator section. With no key in the VFO or transmitter, or with the key closed, a VFO signal should be heard in the receiver (Beat frequency oscillator on) around 1.95 to 2.05 mc. It may be possible to pick up a weaker image signal 900 KC from the wanted signal but it should be ignored in all cases. Harmonics of the 1.95 to 2.05 mc. signal may be used if the receiver cannot tune the 160 meter range.

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h. Turn the main tuning condenser to engage the large stator completely. Turn the bandswitch to the next position clockwise (40 20 15 10). A signal should now be heard from 7.35 to 7.7 mc. Ignore the image signal as before.

i. Leaving the main tuning condenser in the position of step h, turn the bandswitch to the maximum clockwise position 11 (11 meter). A signal should now be found between 6.8 and 7.3 mc.

If no signal is found near the ranges indicated in any of the previous steps, first couple the receiver to the VFO closer than before and try again. If no signal is heard or the signals are out of the ranges, check all the condenser values and the condenser-coil connections on the condenser board with earlier instructions and the schematic diagram. Check the bandswitch connections with the instructions and the schematic diagram.

j. Remove the short VFO antenna from the output plug and plug the PL259 RF plug into the transmitter VFO receptacle. Turn the transmitter crystal selector to the VFO input position and check the VFO for sufficient transmitter drive on all bands. If insufficient VFO output signal is noted, check the output coil L51, bandswitch, and terminal board X52 connections. It should be kept in mind that the transmitter must be capable of being driven by 5.5 volts or less on bands utilizing the 160 meter VFO output and 8 volts or less on bands utilizing the 40 meter VFO output; also, that the output circuit of the VFO includes the input circuit of the transmitter. The total input circuit of the transmitter at the VFO output plug PL259 should have a capacity of approximately 35 mmf. (one foot of RG59U cable is 22 mmfd.) and a shunt resistance of 20,000 ohms or higher. Refer to Operating Instructions, part C, for a discussion of the VFO output characteristics.

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7. Bottom, rubber bumper, and tilt stand assembly. Refer to Figure 3a.

a. With the lip of the bottom cabinet piece oriented downward and forward, fasten the two rear bumpers G54 with 3/8" x 6-32 screws, flat washers, #6 shakeproof washers and 6-32 nuts.

b. Place the front rubber mounting feet over the tilt stand mounting brackets BKT56 as shown in Figure 3a and secure to the cabinet bottom with 3/8" 6-32 screws, flat and lock washers, and 6-32 nuts. Before tightening the nuts, slip the tilt stand in place under the curved ends of the brackets with the tilt stand inner ends extending out from the surface of the bottom plate. Now tighten the 6-32 nuts while holding the tilt stand and tilt stand brackets in place. Try the tilt stand action by moving it upward through an arc of 100 degrees. The tilt stand should not move beyond that position. Return the tilt stand to its former position against the bottom piece.

8. Chassis, cabinet, and escutcheon assembly. Marring and scratching of the painted surfaces of the panel and cabinet by screw driver slippage can be avoided by placing a piece of cardboard with a hole slightly larger than the screw head over the screw head while driving the screws in the following steps.

a. Remove the knobs from the chassis shafts and slide the front panel over the shafts in the position it will be finally mounted. This step will serve to check shaft alignment without placing the chassis in the cabinet. Note any binding or strain and adjust the drive shaft bushing or bandswitch bracket to correct any poor alignment which may be indicated. Lightly oil the control shafts (where they will pass through the panel) and the tuning shaft bushing-bearing.

b. Place the cabinet bottom piece CH51 over the cabinet lower lips. The orientation of the cabinet sides and back can be determined from Figure 2b. Attach the bottom piece to the sides with four #4 sheet metal screws and #4 shakeproof washers. Place the washers under the screw heads. Do not tighten screws completely but allow some shifting of the bottom for final alignment. The shakeproof washers will assure good electrical contact.

c. Place the plugs and cables of the chassis through the large hole in the back of the cabinet, locate the chassis in the cabinet and turn a 3/8-32 nut on the 3/8 key jack bushing . Tighten with fingers only. Allow the nut on the chassis to act as a spacer between the cabinet and chassis. Attach the front of the chassis to the bottom piece with two #4 sheet metal screws and #4 shakeproof washers. Attach the rear of the bottom piece to the cabinet with two #4 sheet metal screws and #4 shakeproof washers, keeping the screws in front of the rear chassis edge. Do not tighten any of the screws completely.

d. Attach the front panel to the cabinet and bottom piece with six #4 sheet metal screws and shakeproof washers. Be careful not to mar the panel or dial plate in this step. Do not tighten screws completely until other screws have been tightened and the top piece has been fitted to assure that the screw holes line up satisfactorily when it is finally secured to the cabinet. Do not secure the top to the cabinet at this time but line up the holes while tightening the bottom screws, chassis screws, and panel screws in the order listed.

e. Loosen the index plate screws and move the index plate so that a 1/32" gap exists between the convex surface of the index plate and the dial edge.

f. Loosen the main dial hub and move the dial until the dial marking between the 7.425 and 1.75 mc markings is in line with the index plate mark when the main tuning condenser C55 rotor plates are completely meshed with the large stator. Although the dial mark is below the dial edge, this setting should be made carefully and checked with the dial mark 180 degrees away

which corresponds to the rear rotor plates being completely meshed with the small stator. The dial hub setscrew should be tightened in position with the dial plate front surface approximately 1/32" back of the index plate front surface. In most cases the dial position relative to the condenser shaft will not require further change. The calibrating instructions include procedures for making the change if it is necessary.

Attach the dial window escutcheon to the front panel with the two small 2-56 screws provided. The screw will self tap into the aluminum. Do not tighten the screw too hard; the self tapped threads may strip. The wide side of the escutcheon should be at the lower edge of the dial window.

g. Attach the knobs to the shafts. Space the back of the knobs 1/8" from the panel. Tighten the tuning knob setscrew while the knob mark is in any position relative to the shaft rotation. Turn the bandswitch shaft to its maximum counterclockwise position and locate the bandswitch knob on the shaft so that the marker lines up with the "plt off" designation. Tighten the knob setscrew securing the knob in this position. Attach VFO cover using six #4 sheet metal screws and shakeproof washers. If shaft binding is noted, remove the bottom piece and realign the tuning shaft bushing to relieve the binding.

B. Frequency Adjustment and Calibration

1. Signal generator, receiver, and VFO setup for the Viking Model 122 VFO calibration.

a. The accuracy of the Viking Model 122 VFO will be no better than that of the signal generator used to calibrate it. To fully utilize the stability and calibration capabilities of the Viking Model 122 VFO, the frequency standard used to calibrate it should have an accuracy of .005% or better. Most crystal standards or crystal calibrated variable frequency standards are satisfactory for normal calibration purposes. A moderate signal output, capable of being easily detected by the receiver which will be used for zero beat indication, is necessary at the following frequencies:

F1a Any given frequency (preferably a VFO low frequency scale mark frequency) between 1.75 to 1.78 mc or any of the first eight harmonics of 1.75 to 1.78 mc in the range of the receiver. 1.76, 3.52, 5.28, 7.04, and 8.80 mc are examples of crystal frequency possibilities.

F2a Any given frequency (preferably a VFO low frequency scale mark frequency) between 1.96 and 2.00 mc or any of the first eight harmonics of 1.96 to 2.00 mc in the range of the receiver.

F3a Any given frequency (preferably a VFO high frequency scale mark frequency) between 7.00 and 7.07 mc or any of the first four harmonics of 7.00 to 7.07 mc in the range of the receiver.

F4a Any given frequency (preferably a VFO high frequency scale mark frequency), between 7.35 and 7.425 or any of the first four harmonics of 7.35 to 7.425 mc.

Warm up the signal generator for a least 1/2 hour or as long as suggested by the signal generator instructions before using it for VFO calibration.

b. Set up a receiver capable of detecting each of the frequencies chosen in 1a. Attach antenna leads to the receiver input and the signal generator output and bring the leads together until signal generator output can be picked up by the receiver. Separate and shorten the leads as found necessary to keep the receiver from blocking due to excessive signal input. Allow the receiver to warm up for about 1/2 hour, to stabilize the local oscillator, and log dial settings for frequencies F1a, F2a, F3a, and F4a. The beat frequency oscillator in the receiver may be used to log and compare the signal generator and VFO frequencies but it is desirable to obtain the final zero beat indications between the VFO and signal generator signals without the beat frequency oscillator. Avoid setting the receiver on or logging image frequencies.

c. Warm up the Viking Model 122 VFO for 1/2 hour with the band switch in the 160 80 40 position. Attach an antenna lead to the output coax plug pin and bring the lead near the receiver antenna. Turn the VFO dial to the frequency F1, between 1.75 and 1.78 mc. chosen as the low 160 meter calibrating point, and find it or its harmonic (near F1a) on the receiver. Note how close the VFO calibration is initially. Repeat the same procedure at the high 160 meter calibrating point and the 40 meter high and low points after moving the bandswitch to the 40 20 15 10 position.

2. 160, 80, 40 meter VFO scale calibration.

a. Set the VFO bandswitch on the 160 80 40 position and the dial at F2, the frequency between 1.96 and 2.00 mc chosen for the high 160 meter calibrating point. Set the signal generator and the receiver at F2a. Adjust the "160 hi" trimmer at the rear of the VFO (refer to Figure 2b) until the VFO zero beats with the signal generator.

b. Turn the VFO to F1, the receiver to F1a, the signal generator to F1a and adjust the "160 lo" padder until the VFO zero beats with the signal generator.

c. Repeat the "160 hi" and "160 lo" adjustment, zero beating the signal generator and VFO as accurately as the ability to resent the two units warrants.

3. 40, 20, 15, 10 meter VFO scale calibration.

a. Set the VFO bandswitch on the 40 20 15 10 position and the high frequency dial scale at F 4, the frequency between 7.35 and 7.425 mc chosen for the high 40 meter calibration. Set the signal generator and the receiver at F4a. Adjust the "40 hi" trimmer at the rear of the VFO until the VFO zero beats with the signal generator.

b. Turn the VFO to F3, the frequency between 7.00 and 7.07 mc chosen for the low 40 meter calibration, the receiver to F3a, the signal generator to F3a, and adjust the "40 lo" padder until the VFO zero beats with the signal generator.

c. Repeat the "40 hi" and 40 lo" adjustment, zero beating the VFO as accurately as the ability to reset the two units warrants.

4. 15 and 11 meter index marking and 11 meter calibration.

a. Set the VFO dial on the 7, 14, 28 mc mark. Place a light pencil mark or scratch on the escutcheon window starting at the lower inside edge in line with the 21 mc. mark. Carefully remove the escutcheon window and make the mark deeper across the lower inside edge with a thin hacksaw blade or similar tool. If a more elaborate index marker is desired for the 15 and 11 meter band, a right angle piece of #24 or #22 wire, 1/8" on each leg, can be formed and cemented into the slot with the protruding leg on the inside edge extending toward the 21 mc mark when the escutcheon window is again replaced.

b. The 11 meter band VFO output is in the neighborhood of 6.75 mc. A given frequency, F5a, in the range 6.7 to 6.85 mc or any of the first four harmonics of the 6.7 to 6.85 mc range may be used to calibrate the 11 meter range. Turn the VFO bandswitch to the 11 meter position and set the dial scale of the 11 meter band on the standard frequency F5 or the harmonic of the standard signal which falls in the 11 meter band. Set the receiver to the 11 meter range or a subharmonic and detect the standard signal frequency. Adjust the "11 meter" trimmer until the VFO zero beats with the standard frequency.

c. Recheck the 40 20 15 10 calibration after the 11 meter adjustment. There is little likelihood that further readjustment is necessary unless a large change was required in the "11 meter" setting.

5. VFO Calibration Using the Transmitter Crystal Oscillator or other Standard Signal Sources.

a. Crystals of known frequency and accuracy in the frequency ranges F1a, F2a, F3a, and F4a (designated in paragraph B1a) can be used in the transmitter crystal oscillator to provide standard frequency signals for the VFO calibration. The first stages of the transmitter must be arranged to allow the crystal oscillator to operate at the same time the VFO is operating. When the VFO is used with the Viking II transmitter, the phone cw switch must be in the "cw" position, the crystal switch on the position of the desired crystal, and the keying circuit closed (the Viking II keying circuit is closed when no key plug has been inserted). If the signal from the transmitter oscillator cannot be detected by the receiver readily, an antenna lead may be added by placing one end of a two or three foot lead in the vicinity of the oscillator tank coil and bringing the other end outside of the transmitter cabinet. The crystal oscillator signal magnitude can also be built up by tuning the plate circuit of the crystal oscillator to the crystal frequency or its harmonics. The VFO frequency can now be compared to the crystal oscillator frequency and adjustments can be made according to the procedure previously outlined in B4.

b. An example of calibrating the VFO using actual crystal values may be helpful. Assume that the following crystals have been found as part of the amateur station equipment: 7060 KC, 3690 KC, and 1980 KC. The dial calibration points then become:

$$F1 = \frac{7.060}{4} = 1.765 \text{ mc}$$

$$F2 = 1.980 \times 1 = 1.980 \text{ mc}$$

F3 = 7.060 x 1 = 7.060 mc

F4 = 3.690 x 2 = 7.380 mc

The receiver setting and VFO harmonic which may be used for each respective dial calibration frequency becomes:

F1a = 7.060 x 1 = 7.060 mc

F2a = 1.980 x 4 = 7.920 mc

F3a = 7.060 x 1 = 7.060 mc

F4a = 3.690 x 2 = 7.380 mc

Proceed as follows:

1) Set the VFO bandswitch on 160 80 40 and the dial on the 1.980 mc mark. Zero beat the fourth harmonic of the VFO output with the fourth harmonic of the 1.980 mc crystal oscillator output by adjusting the "160 hi" trimmer.

2) Set the VFO dial on the 1.765 mc mark and zero beat the fourth harmonic of the VFO signal with the 7.060 mc crystal oscillator signal by adjusting the "160 lo" padder. Repeat steps 1 and 2 to minimize adjustment interaction.

3) Set the VFO bandswitch at 40 20 15 10 and the dial on the 7.38-29.250 mc high frequency scale mark. Zero beat the VFO signal with the second harmonic of the crystal oscillator signal by adjusting the 40 "hi trimmer".

4) Set the VFO dial to the 7.060-28.240 mc mark. Zero beat the VFO signal with the crystal oscillator signal by adjusting the "40 lo" padder. Repeat steps 3 and 4 to minimize adjustment interaction.

5) The 11 meter band setting may be made with a crystal which will place a harmonic signal in the 11 meter band. Assume a 1820 KC crystal is available. Set the VFO bandswitch on 11 and the dial on 27.3 mc (the 15th harmonic of 1.820 mc). Zero beat the fourth harmonic of the VFO to the 15th harmonic of the crystal oscillator with the "11 meter" trimmer. Make certain that the receiver is tuned to the correct harmonic before attempting to make the 11 meter setting.

c. The user may think of several sources of standard signals other than those mentioned. In each case the accuracy of the source should be known before using it. Many combinations of harmonics can be found and no attempt has been made to cover all of them in this discussion. The beat frequency oscillator of the receiver can be used to "remember" a standard signal for a short time. The receiver must be thoroughly warmed up and operated without excessive input signal to prevent local oscillator shift errors from being introduced. Other signal sources which may be used by not discussed are:

1) The signal of another amateur station whose frequency has been determined by a standard.

2) The harmonics of a signal generator whose output signal has been zero beat with a broadcast station.

3) Signals of W W V discussed in the next topic.

The VFO user must adapt his techniques to the signal source he has available.

d. Band edge crystals or crystals near the usual operating frequencies of the amateur stations are always valuable for occasional monitoring of the VFO signals. They may be used in a separate oscillator circuit or the crystal oscillator stage of the transmitter.

6. VFO calibration using the W W V 10 mc signal. This calibration is not recommended if other standard signal sources are available. It will be noted that most calibration points are on the ends of the bands and the 40 20 15 10 band **high** scale calibration includes the tracking error of the low frequency 160 80 40 band. The receiver, the receiver BFO, and the VFO should be warmed up for 1/2 hour before calibrating.

a. 160, 80, 40 meter calibration.

1) Zero beat the receiver BFO to the 10 mc W W V signal.
2) Set VFO dial at 2.00 mc and the bandswitch on 160 80 40.
3) Adjust the "160 hi" VFO trimmer until the fifth harmonic of the VFO is zero beat with the receiver BFO.
4) Leaving the VFO at this setting, zero beat the receiver BFO with the seventh harmonic of the VFO (14 mc).
5) Turn the VFO to 1.75 mc and adjust the "160 lo" VFO trimmer to zero beat the eighth harmonic of the VFO with the receiver BFO.
6) Adjust both ends of the 160 80 40 bands to zero beat the eighth and seventh harmonics of the VFO with the receiver BFO as necessary.

b. 40, 20, 15, 10 meter calibration.

1) Set the VFO dial at the 1.85 mc mark and zero beat the receiver BFO to the eighth harmonic of the VFO frequency at 14.8 mc.
2) Set the VFO bandswitch to 40 20 15 10 and the dial to the 7.40-29.6 mc mark. Zero beat the second harmonic of the VFO to the 14.8 mc receiver of the VFO to the 14.8 mc receiver setting by adjusting the "40 hi" trimmer.
3) Set the VFO bandswitch and dial for 1.75 mc output again and zero beat the receiver BFO at 14 mc. Set the VFO bandswitch and dial at the 40 20 15 10 band low frequency end (7.00, 14, 21 and 28 mc) and adjust the 40 "lo padder" to zero beat the VFO second harmonic with the receiver 14.0 mc BFO setting.
4) Repeat steps 1, 2 and 3 if greater accuracy is desired.

c. 11 meter calibration.

1) Set the VFO bandswitch and dial for 1.80 mc output.
2) Tune the receiver to 27 mc and zero beat the receiver BFO to the 15th harmonic of the VFO.
3) Set the VFO bandswitch on 11 and the dial on 27.0 mc. Adjust the "11 meter" trimmer to zero beat the fourth harmonic of the VFO to the receiver BFO setting.

7. Procedure if the VFO frequency cannot be adjusted to the dial markings due to apparent lack of trimmer or padder range.

a. Check to make certain the frequency standard used is accurate (crystal used in amateur service are often found to differ from their marked frequency due to holder conditions, oscillator circuit loading or non-critical original calibration).

b. Make certain image frequencies are not being mistaken for desired frequencies in the receiver.

c. If after checking the frequency standard and receiver settings, the VFO frequency cannot be adjusted to chosen dial marks, adjust the trimmers and padders to bring the VFO frequency as close as possible to the dial mark frequencies. Remove the VFO cover and recheck the dial location relative to the tuning condenser shaft according to paragraph A 8e. If the dial requires relocating, try calibrating the VFO scale again, as directed in previous instructions, with the top off. If the calibration appears normal, replace the cover and recheck all calibration points with the cover on.

d. Upon removal of the cover in step c, if the dial location is found to be correct, note the engagement of the trimmers and padders.

    1) If any padder or trimmer is fully engaged and all of the others are engaged 1/4 or more, loosed the dial hub setscrews and move the dial counter clockwise with respect to the tuning condenser shaft (keeping the shaft stationary) an amount corresponding to 1/16" on its periphery.
    2) If any of the padders or trimmers is completely open, move the dial clockwise, with respect to the condenser shaft, an amount corresponding to 1/16" on the dial periphery.
    3) If any of the trimmers or padders is closed and the corresponding trimmer or padder on the same band is open, add a 6.8 mmf ceramic NPO condenser (bk-bl-gy-wt-gn) (C50 or C65) across the closed padder or trimmer to extend its range.

If the VFO can now be tracked to the dial, replace the cover and complete calibration.

C. Operation

1. General operating characteristics and requirements.

a. The Viking Model 122 VFO has been designed as a crystal substitute. The output of

a minimum of 8 volts r.m.s. across 25,000 ohms in the frequency range of 7.00 to 7.425 mc and
a minimum of 5.5 volts r.m.s. across 25,000 ohms in the frequency range of 1.75 to 2.00 mc.

may be applied across the crystal oscillator grid circuit of many transmitters directly, to take the place of 160 meter and 40 meter crystals normally used with the transmitters. A recommended basic transmitter first stage oscillator-amplifier circuit and a recommended booster amplifier will be discussed later for transmitters where more VFO isolation or output is required.

b. The VFO has only two controls. It is imperative that the correct dial scale corresponding to the bandswitch position is at the index window when operating.

The VFO will drive many transmitters on 40 meters in either the 160 80 40 or 40 20 15 10 bandswitch positions. The 160 80 40 meter position is usually preferred for 40 meter operation because the chance of "straight through" feedback is eliminated. The bandswitch setting for all other bands should be on the indicated band. Suitable frequency multiplication must be provided in the transmitter exciter stages.

c. The output circuit of the Viking Model 122 VFO is a broadly tuned circuit which depends on the output cable and the transmitter input capacity to some extent. It is therefore impossible to obtain full VFO output with a cable length, between the VFO and transmitter, that differs markedly from that provided with the VFO. The transmitter total input capacity should be between 30 and 40 mmf to center the VFO maximum output in the VFO frequency ranges (the Viking II transmitter has a one foot length of RG59U, the VFO input jack, and the tube input capacity to make up approximately 30 mmf.).

d. Keying can be arranged so that the VFO is keyed by the transmitter keying circuit. Pin 8 of the VFO power plug carries the keying circuit. With such an arrangement the VFO simply becomes a frequency determining device and normal operating techniques of crystal transmitter operation apply. If it is desired to key the transmitter stage alone while the VFO is allowed to operate continuously, a shorted plug should be plugged into the rear VFO key jack. If it is desired to key the VFO without keying the transmitter, simply remove the key plug from the transmitter and insert the key plug in the VFO keying jack.

e. When the transmitter is operated "straight through" with the VFO on 160 meters or 40 meters, avoid placing the VFO in a location where high output RF fields reach the VFO. Although the rather complete shielding on the VFO will keep the likelihood of frequency pulling to a minimum, the high sensitivity of the low level VFO oscillator circuit may make a very slight feedback troublesome.

f. "Zero beating" receiver signals with the VFO may require the reduction of the transmitter exciter leakage to the receiver. Two ways to do this are:

   1) Disabling the first stage of the transmitter while the VFO is allowed to oscillate. The VFO-to-receiver signal may be fed out by a small auxiliary lead in the circuit of the VFO output at the transmitter.

   2) Disconnecting the VFO from the first stage of the transmitter by the crystal VFO selector switch. The sensitivity of the first transmitter stage may be so high that the switch terminal to terminal capacity may still couple enough VFO signal to the first stage to create a signal level in the receiver sufficient to mask the received signal. In this case, provision for attenuating the VFO signal at the first stage can be incorporated in the crystal VFO selector switch. The crystal positions 1 and 2 of the Viking II transmitter lend themselves nicely when resistors are placed between the outside jacks of the crystal positions and a chassis ground. The resistors thus shunt the grid of the input stage to ground when the crystal switch is put in the 1 or 2 positions. The value of the resistor can be adjusted to attenuate the signal to the degree desired.

g. The power requirement of the Viking Model 122 VFO.

An auxiliary power supply or the low voltage power supply of the transmitter must be capable of supplying 250 to 300 volts of plus D.C. to chassis ground at 15 ma and 6.3 volts A.C. to chassis ground at .3 ampere. The 250 to 300 volt supply may be unregulated but it should not be subject to sudden voltage

changes or excessive voltage change with a change of 5 to 10 ma current drain. An octal socket is a natural connecting device for the octal plug provided on the VFO.

2. Operation with the Viking II Transmitter. Most of the comments made under General Characteristics apply to the use of the VFO with the Viking II. A few details and suggestions are included to help the Viking II owner make his initial installation.

   a. Plug the VFO power plug in the VFO socket in the left rear corner of the chassis. The VFO output coax plug should be plugged in the input receptacle below the fuse plug. Check both the RF input lead and VFO power lead for correctness of wiring, continuity and shorts if any difficulty arises in obtaining VFO drive.

   b. The crystal selector of the Viking II must be in the "0" position for VFO operation. Band edge or other calibrating crystals may be place in any crystal position and referred to simply by turning the crystal selector to the proper position.

   c. The discussion of keying under general operating characteristics applies directly to the Viking II. When the Viking II is on "phone" the keying circuit is opened when the plate switch is turned off. If no plug has been inserted in the VFO the phone-cw switch must be placed on "cw" to close the VFO keying circuit when the plate switch is off. The method of checking the VFO frequency in the receiver is to turn the phone cw switch to "cw". If the exciter coupling to the receiver is too great, turn the crystal selector switch to an empty or shunted crystal position to reduce the signal as discussed in C1f.

3. Operation with other transmitters.

   In general the Viking Model 122 VFO output will be applied at the grid circuit of the crystal oscillator of a transmitter. Some considerations which must be made when the VFO is to be used with a given transmitter are:

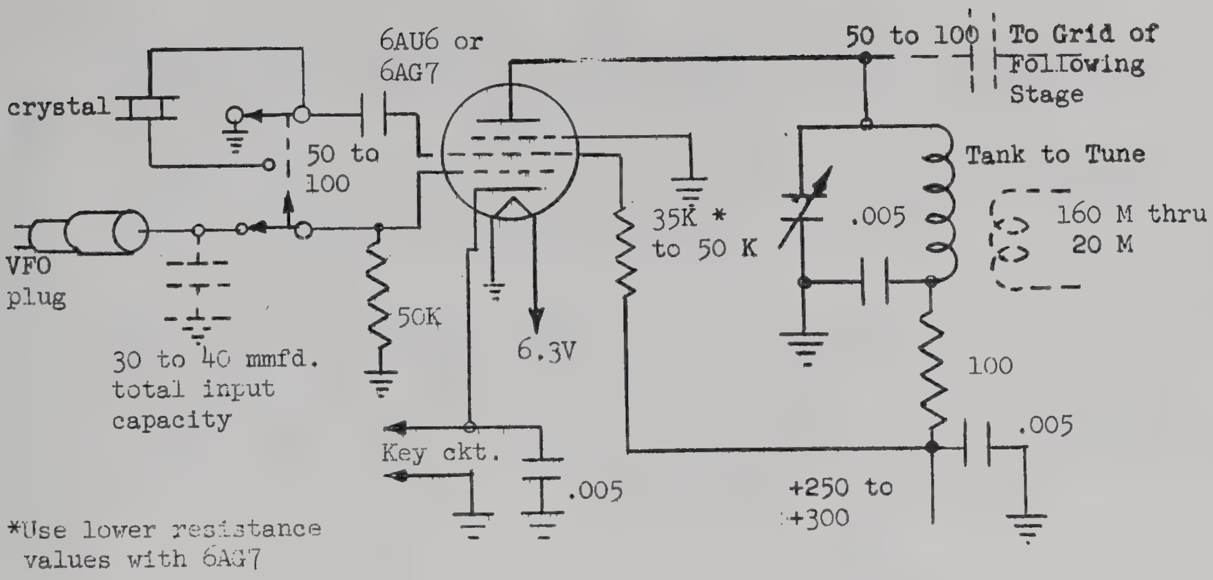
   a. Power supply for the VFO (discussed in C1g)

   b. The power sensitivity of the first stage of the transmitter. The voltage output of the VFO (listed in C1a) must be sufficient to drive the transmitter first stage to a value necessary for the required amplification or frequency multiplication.

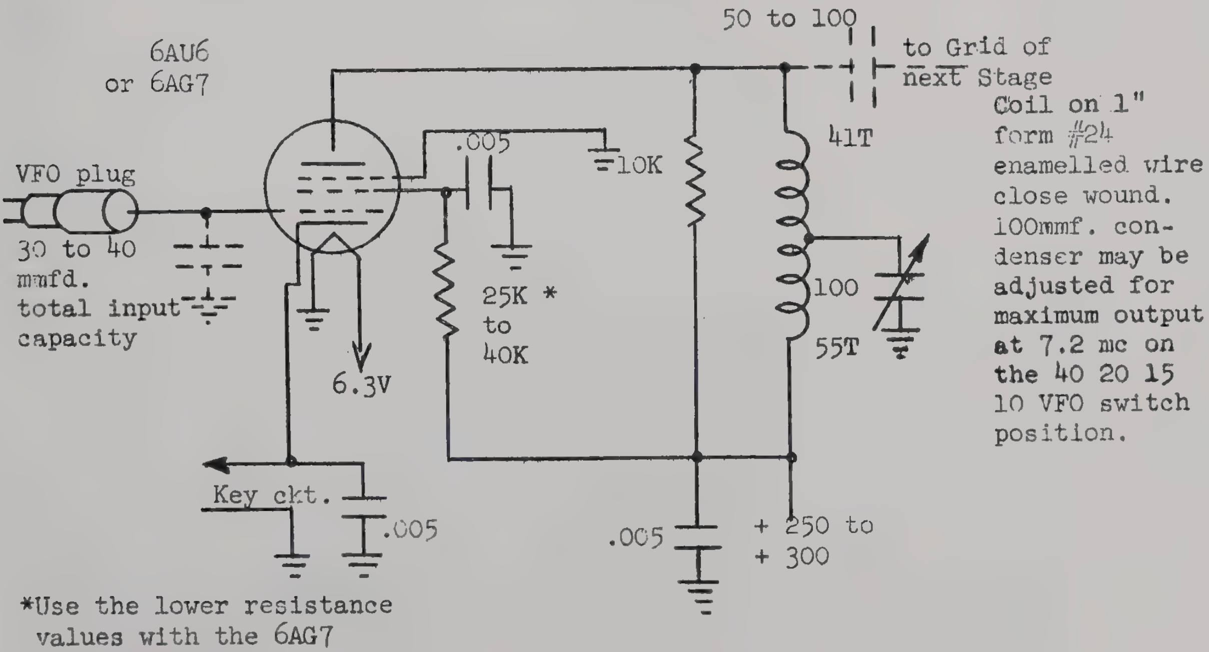
   c. Sufficient isolation between the tuned tank circuit of the first transmitter stage and the VFO must be provided to prevent feedback effects when that tank circuit is tuned to the VFO frequency.

   d. Some triode oscillator and tri-tet oscillator stages will not provide sufficient isolation or sensitivity to be used directly with the VFO. A suggested transmitter crystal oscillator-amplifier circuit is shown on the next page. This circuit properly built will provide the first stage sensitivity and power output required for many transmitters.

      A 6AU6 tube will provide sufficient isolation, sensitivity, and an output of more than one watt on "straight through" operation and somewhat less as a frequency doubler if proper tank constants are provided. A 6AG7 tube may be used if more power output is required. A 6AG7 can be expected to provide two or three times as much power output as the 6AU6 as an amplifier or frequency doubler. Tubes with higher plate to grid capacity may give feedback troubles. Reasonable circuit layout and good separation of grid and plate circuit components in this stage is desirable. The 6AG7 power requirement is somewhat greater than that of the 6AU6.



3. e. If 25 to 30 volts of RF at the VFO frequency ranges will drive the transmitter, an amplifier stage can be added at the transmitter. The amplifier may be directly coupled to the transmitter input circuit. The circuit below will provide 25 to 50 volts across 10,000 ohms without adding tuning controls. The 6AG7 tube can be expected to have an output of 40 to 50 volts while the 6AU6 can be expected to have an output of 20 to 30 volts RF. The amplifier should be located near the input stage of the transmitter. No capacity should be added in the plate circuit of the amplifier other than the output capacity of the amplifier tube and the input grid of the tube being driven by the amplifier. A suggested circuit is shown below.



6AU6
or 6AG7
50 to 100
to Grid of next Stage
Coil on 1" form #24 enamelled wire close wound. 100mmf. condenser may be adjusted for maximum output at 7.2 mc on the 40 20 15 10 VFO switch position.
VFO plug
30 to 40 mmfd. total input capacity
.005
10K
41T
100
55T
25K *
to
40K
6.3V
Key ckt.
.005
.005
+ 250 to
+ 300
*Use the lower resistance values with the 6AG7

The power supply of the transmitter should be capable of supplying the power required by the tube (250 to 300 VDC at 13 ma, 6.3V at .3A for the 6AU6, and 250 to 300 VDC at 25 ma, 6.3V at .65A for the 6AG7).

f. The output circuit of the Viking Model 122 VFO has a D.C. resistance of 22,000 ohms. The output circuit of the VFO must be isolated from the transmitter input grid by a blocking condenser (100 mmf) unless the 22,000 ohm grid resistance is not too low for the input stage.

g. Undoubtedly many existing transmitters can be connected directly or readily adapted to the Viking Model 122 VFO without much effort. It is recommended that parts C1 and C3 of these instructions and the transmitter under consideration be studied before proceeding to connect the VFO to a transmitter. Temporary connections and trials should be made before changing or adding circuits. Permanent arrangements can be made after the transmitter circuits have been found to utilize the VFO as the user desires.

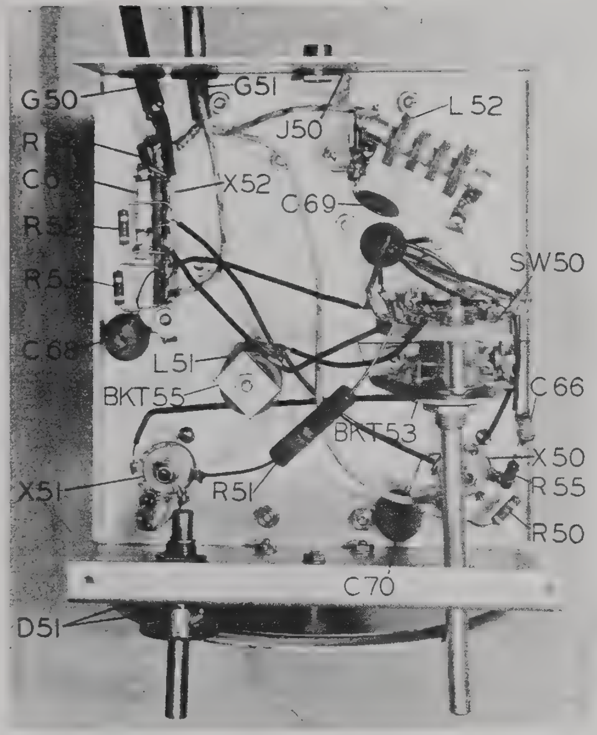


FIGURE 1a
CHASSIS BOTTOM

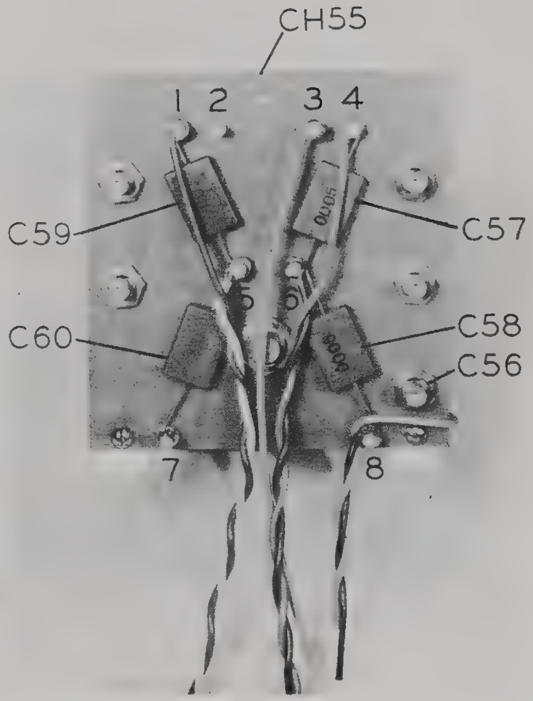


FIGURE 1b
REAR CONDENSER
TERMINAL BOARD

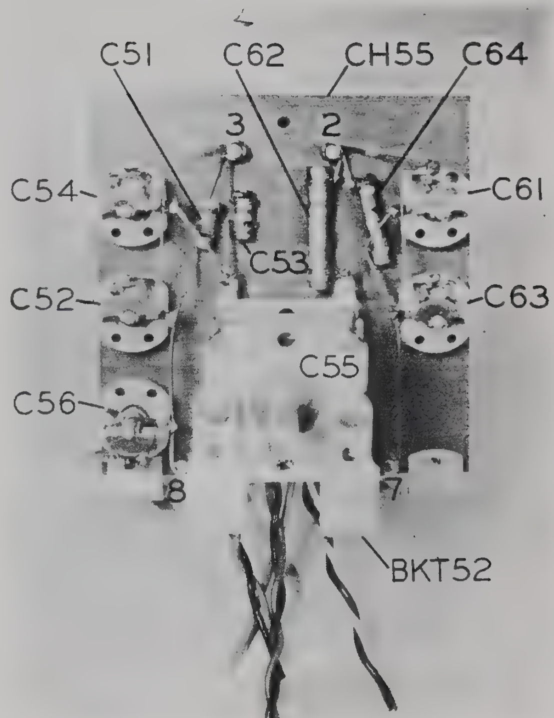


FIGURE 1c
FRONT CONDENSER
TERMINAL BOARD

PART D: PHOTOGRAPHS, CHARTS, AND SCHEMATIC DIAGRAMS

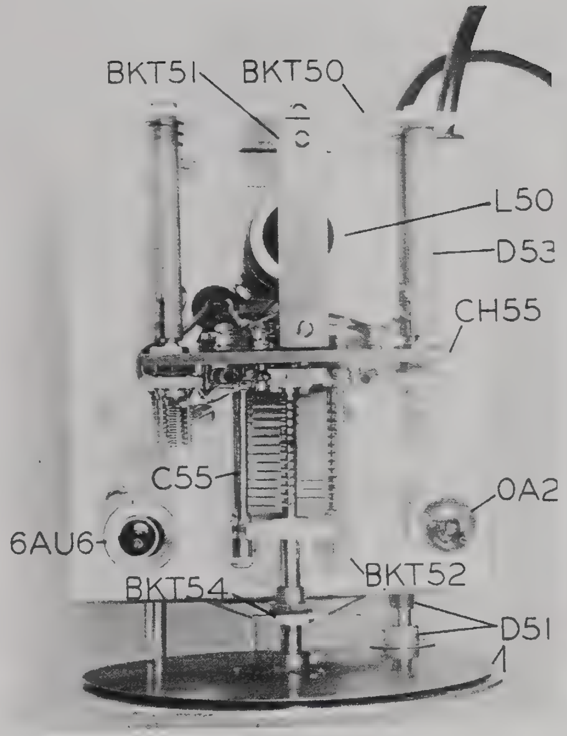


FIGURE 2a
CHASSIS TOP

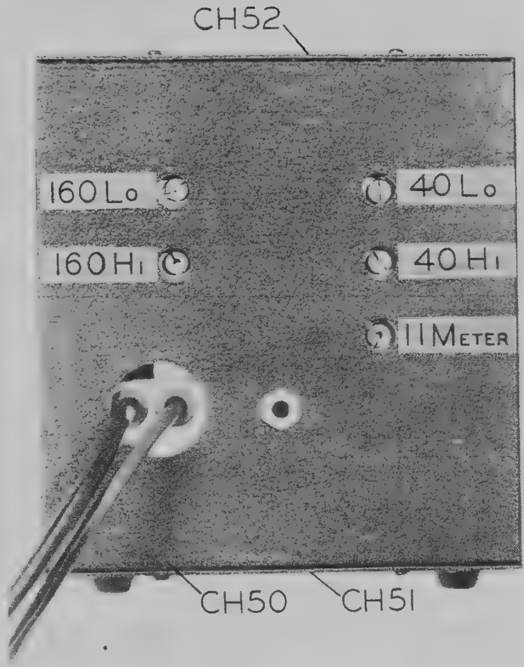


FIGURE 2b
CABINET BACK

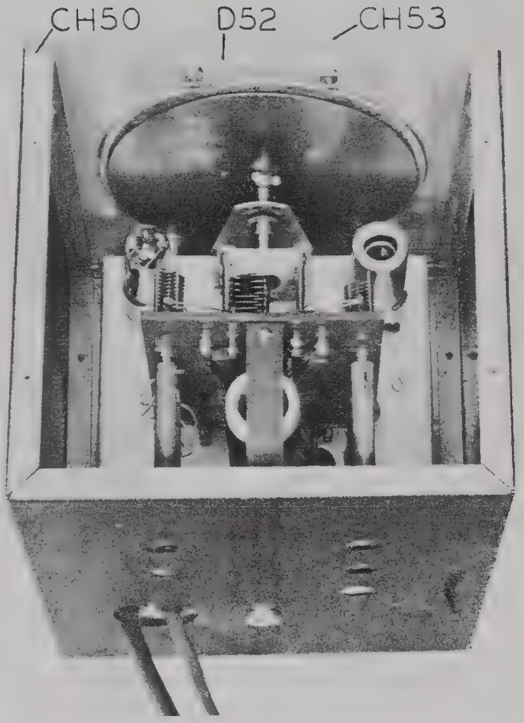
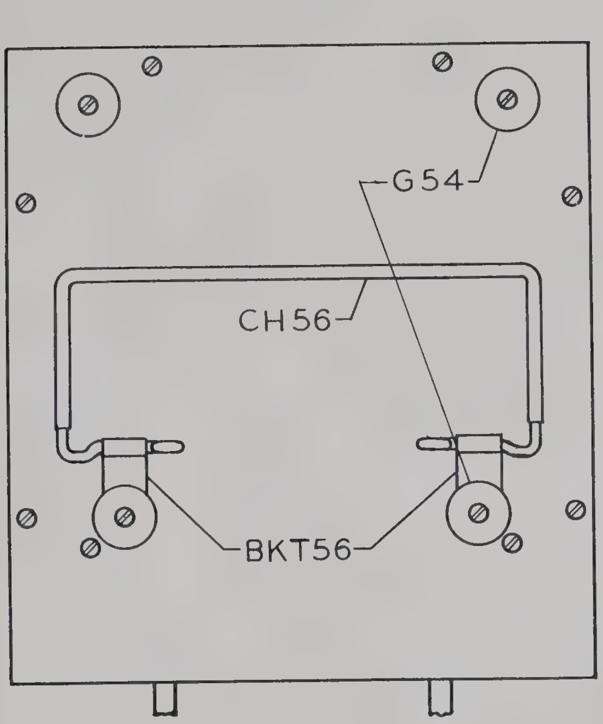


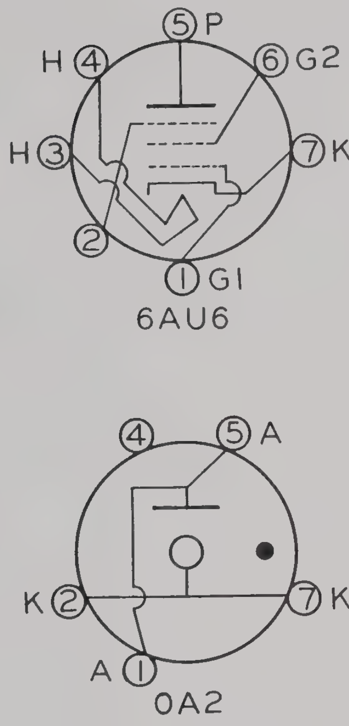
FIGURE 2c
CABINET TOP

FIGURE 3a



CABINET BOTTOM
AND TILT STAND

FIGURE 3b

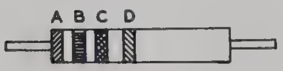


SOCKET CONNECTIONS
BOTTOM VIEW

	SIGNIF. FIGURE	DECIMAL MULTIP.	PERCENT TOLER.	TEMP. COEFF.	CHARAC-TERISTIC	VOLTAGE RATING
BLACK	0	1		NPO	A	
BROWN	1	10	1	N030	B	100
RED	2	100	2	N080	C	200
ORANGE	3	1000	3*	N150	D	300
YELLOW	4	10000	4	N220	E	400
GREEN	5		5	N330	F	500
BLUE	6		6	N470	G	600
VIOLET	7		7	N750		700
GRAY	8		8			800
WHITE	9		9#			900
NO COLOR			20			500

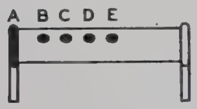
* #ON CERAMIC CONDENSERS; * IS 2.5%, # IS 10%

FIXED
RESISTORS



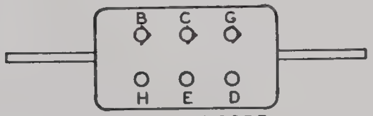
A-FIRST SIGNIF. FIGURE
B-SECOND SIGNIF. FIGURE
C-DECIMAL MULTIPLIER
D-TOLERANCE IN PERCENT
GOLD 5%
SILVER 10%
NO COLOR 20%

FIXED CERAMIC
CAPACITORS

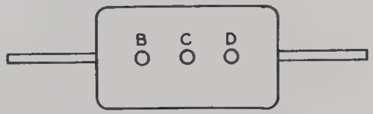


A-TEMPERATURE COEFF.
B-FIRST SIGNIF. FIGURE
C-SECOND SIGNIF. FIGURE
D-DECIMAL MULTIPLIER
E-TOLERANCE

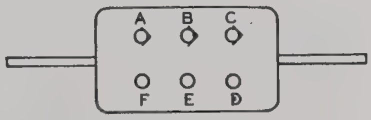
FIXED
CAPACITORS



RMA 6 DOT CODE



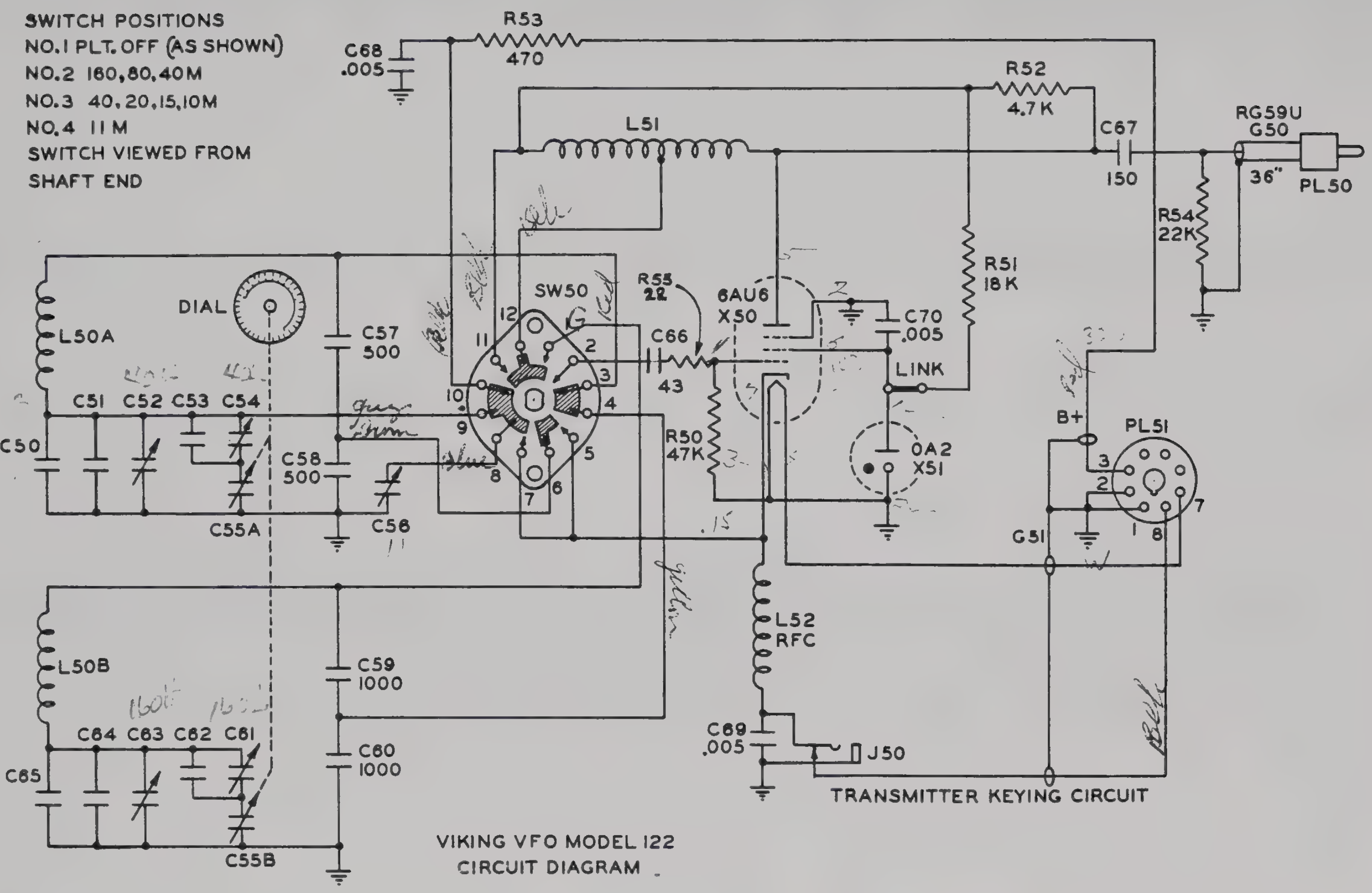
RMA 3 DOT CODE



JAN FIXED

A-MICA BLACK PAPER SILVER
B-FIRST SIGNIF. FIGURE
C-SECOND SIGNIF. FIGURE
D-DECIMAL MULTIPLIER
E-TOLERANCE
F-CHARACTERISTIC
G-THIRD SIGNIF. FIGURE
H-VOLTAGE RATING

FIGURE 3c, RESISTOR-CONDENSER COLOR CODES



VIKING VFO MODEL 122
CIRCUIT DIAGRAM

FIGURE 4

E. VIKING VFO MODEL 122

Parts List

Part No. or Drawing No.	Item No.	Qty.	Description
17.789-1	CH50	1	Cabinet sides and back
17.790-1	CH51	1	Cabinet bottom
17.790-2	CH52	1	Cabinet top
17.791-3	CH53	1	Panel
17.788-1	CH54	1	Chassis
23.966-1	CH55	1	Condenser Mounting Board Assembly
23.979	CH56	1	Tilt Stand
16.1053-1	BKT50	1	Rear Trimmer Coupling Bracket
23.962	BKT51	1	Coil Support Bracket Assembly
16.25-1	BKT52	2	Condenser Mounting Bracket
16.857-4	BKT53	1	Switch Mounting Bracket
16.857-3	BKT54	1	Dial Mounting Bracket
16.120-7	BKT55	1	Output Coil Clamp piece (spacer)
16.1060	BKT56	2	Tilt Stand Bracket
13.123-7	D50	1	Panel Bearing (in 3/8" hardware env.)
23.969-1	D51	1	Dial Drive Assembly
23.971-1	D52	1	Escutcheon, Index Assembly
23.970-1	D53	5	Insulated Coupling Shaft Assembly
23.980-3	K52	2	Knob
22.113-1	G53	3	Rubber Grommet 9/16 OD
22.632-1	G54	4	Rubber Bumpers
71.91-100	W50	4 ft.	Black Plastic Covered #20 Copper Wire
71.91-105	W51	7 in.	Green Plastic Covered #20 Copper Wire
71.91-102	W52	7 in.	Red Plastic Covered #20 Copper Wire
71.91-104	W53	½ ft.	Yellow Plastic Covered #20 Copper Wire
71.91-101	W54	½ ft.	Brown Plastic Covered #20 Copper Wire
71.91-108	W55	½ ft.	Gray Plastic Covered #20 Copper Wire
71.91-106	W56	½ ft.	Blue Plastic Covered #20 Copper Wire
		1	#6 Hardware envelope
		1	#4 Hardware envelope
		1	3/8" Hardware and terminal envelope
22.794	SW50	1	VFO Bandswitch (4 Pos.)
23.968	L50	1	Dual Oscillator Coil Assembly
23.967	L51	1	Output Coil Assembly
102-750	L52	1	Radio Frequency Choke
22.224	J50	1	Mallory type A2A Transfer Jack
22.695	PL50A	1	PL259 Coaxial Plug
22.799	PL50B	1	UG176U Coaxial Adapter
71.32-178	G50	3 ft.	RG59U Coaxial Cable
71.32-202	G51	3½ ft.	Belden #8735 - 3 cond. Shielded Cable
22.800	PL51	1	Male Connector Amphenol 86-PM8
120-277-1	X50, X51	2	7 pin Miniature Sockets (Shielded)
22.740-5	X52	1	"2005" Jones Terminal Strip
133-278-7	S50	1	1 3/4" Miniature Tube Shield
22.717	R50	1	47,000 or 51,000 ohm ½ watt Resistor
22.802	R52	1	4,700 ohm ½ watt Resistor
22.801	R53	1	470 ohm ½ watt Resistor
22.716	R54	1	22,000 or 24,000 ohm ½ watt Resistor
22.713	R55	1	22 ohm ½ watt Resistor
160-104-24	C52	1	9M11 Var. Cond. (Rotor term. opposite side
22.803	R51	1	18,000 ohm 2 watt Resistor

Part No. or Drawing No.	Item No.	Qty.	Description
160-107-24	C54	1	15M11 Var. Cond.(Rotor term. opposite side)
160-130-1	C61	1	30M8 Variable Condenser
160-107-1	C63, C56	2	15M11 Variable Condenser
169-17	C55	1	Special LA type Variable Condenser
22.804	C57, C58	2	500 mmfd. +2% Silver Mica Condenser
22.805	C59, C60	2	1000 mmfd. +2% Silver Mica Condenser
22.827	C68,C69,C70	3	.005 mfd 500 V.W. Bypass Condenser
22.806	C51	1	47 ± 2½% mmfd. N220 Ceramic Condenser
22.807	C53, C66	2	43 ± 2½% mmfd. NPO Ceramic Condenser
22.808	C67	1	150 ± 2½% mmfd. NPO Ceramic Condenser
22.809	C64	1	91 ± 2½% mmfd. N080 Ceramic Condenser
22.810	C50, C65	2	6.8 ± 0.5 mmfd NPO Ceramic Condenser
22.823	C62	1	140 ± 2½% mmfd NPO Ceramic Condenser

STANDARD WARRANTY

Adopted and Recommended by the
Radio - Electronics - Television Manufacturers Association

The E. F. Johnson Company warrants each new radio product manufactured by it to be free from defective material and workmanship and agrees to remedy any such defect or to furnish a new part, except for electron tubes, in exchange for any part of any unit of its manufacture which under normal installation, use and service disclosed such defect, provided the unit is delivered by the owner to us or to our authorized radio dealer or wholesaler from whom purchased, intact, for our examination, with all transportation charges prepaid to our factory, within ninety days from the date of sale to original purchaser and provided that such examination disclosed in our judgement that it is thus defective.

This warranty does not extend to any of our radio products which have been subjected to misuse, neglect, accident, incorrect wiring not our own, improper installation, or to use in violation of instructions furnished by us, nor extend to units which have been repaired or altered outside of our factory, nor to cases where the serial number thereof has been removed, defaced or changed, nor to accessories used therewith not of our own manufacture, nor to electron tubes.

Defective electron tubes should be returned directly to the tube manufacturer for adjustment at the following addresses:

(a) For RCA tubes to: Adjustment Service, RCA at the nearest of the following addresses:

34 Exchange Place
Jersey City 2, N. J.

589 East Illinois Street
Chicago 11, Illinois

420 So. San Pedro Street
Los Angeles 13, California

(b) For General Electric tubes to:

Adjustment Service, Owensboro Tube Works
General Electric Company
Owensboro, Kentucky

Any part of a unit approved for remedy or exchange hereunder will be remedied or exchanged by the authorized radio dealer or wholesaler without charge to the owner.

This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to assume for us any other liability in connection with the sale of our radio products.

REPRESENTATIVES:

Atlanta 5, Ga., James Millar Associates, 1036 Peachtree St., N. E., ELgin 0919

Boston 6, Mass., Paul R. Sturgeon, 25 Huntington Ave., COpley 7-2562

Chicago 31, Ill., Ellinger Sales Co., 6540 Northwest Highway, ROdney 3-1570

Columbus 15, Ohio, Wm. E. McFadden, 150 East Broad St., MAin 3363

Denver 3, Colo., Ronald G. Bowen, 825 Broadway, Rooms 307-309, AComa 5211

Highland Park 3, Mich., A.B.M. Sales Company, 15850 Third Ave.,
TOwnsend 8-0044

Kansas City 8, Mo., Herbert A. Roes & Co., 2601 Cherry St., HArrison 2036

Los Angeles 15, Calif., Don C. & Wm. H. Wallace, 1206 Maple Ave.,
Bendix Building, RIchmond 7-0401

Minneapolis 1, Minn., Fred B. Hill Co., 256 1st Ave. No., MAin 8353

New York 16, N. Y., F. Edwin Schmitt Co., 136 Liberty St., WOrth 2-6550

Philadelphia 2, Pa., S. K. MacDonald, Inc., 1531 Spruce St., KIngsley 5-1205

Phoenix, Ariz., Harry A. Moore Sales Co., 4142 North 18th St., AMherst 5-4662

Pittsburgh 22, Pa., S. K. MacDonald Inc., 715 State Theatre Building,
335 Fifth Ave., ATlantic 1-2253

Portland 10, Ore., Dave M. Lee Co., 2712 N. W. Raleigh St., BEacon 2241

San Francisco, Calif., Logan Sales Co., 530 Gough St., HEmlock 1-5127

Seattle 1, Wash., Dave M. Lee Co., 2517 Second Ave., MAin 5512

Syracuse 4, N. Y., Wally B. Swank, 2310 Bellevue Avenue, 76-8056

Washington, D. C., S. K. MacDonald Inc., 217 Riggs Bank Building,
3308 14th St., N. W., COlumbia 3938

CANADA

Toronto 12, Ont., A. C. Simmonds & Sons Ltd., 100 Merton St., MAyfair 9111

EXPORT

New York 7, N. Y., M. Simons & Son Co., 25 Warren St., BArclay 7-5513
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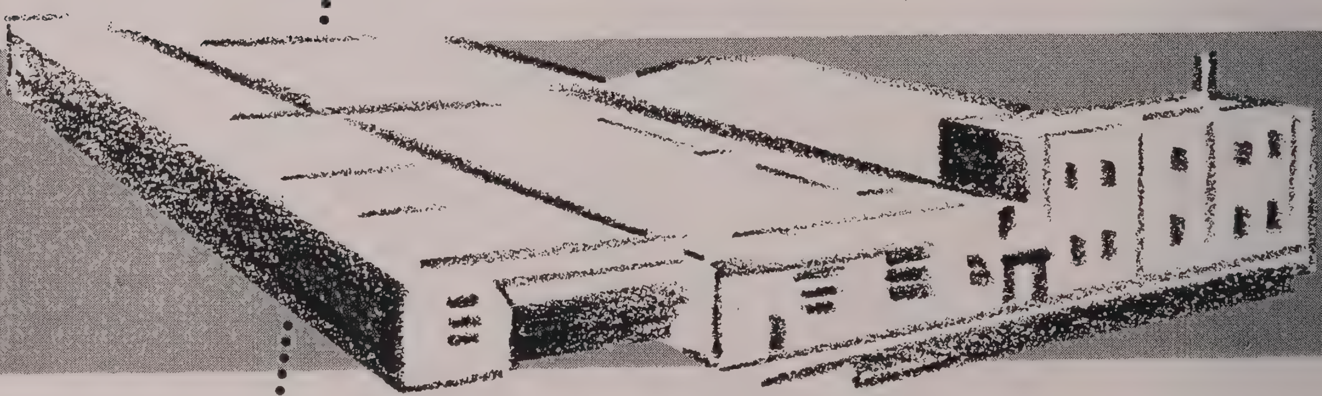


E. F. JOHNSON COMPANY

WASECA, MINNESOTA • U. S. A.

JOHNSON

ELECTRONIC
EQUIPMENT

F. JOHNSON COMPANY
SECA MINNESOTA

OPERATING MANUAL
JOHNSON VIKING II RADIO TRANSMITTER

Viking II Transmitter Installation and Operation

The successful operation of any radio equipment is largely dependent on the operator's understanding of the equipment. This operating instruction manual is set up in several parts, each with the purpose of making the operator more familiar with the Viking II. The main parts are:

A Initial Installation Page 3
Novice Operation Page 4
B Theory of Operation Page 5
C Viking II Tuning Details Page 9
D Pi Network Tuning and Harmonic Suppression Page 14
E Trouble Shooting Page 20
F Photographs, Charts, and Schematic Diagrams Page 25
G Parts List At rear of book

WARNING

The voltages encountered in this piece of equipment are high enough to cause fatal injury! Practice safety rules until they are second nature. Always turn off the high voltage before making any adjustment inside the transmitter. Never depend on a bleeder resistor to discharge filter condensers. After the power is turned off, short circuit the high voltage circuit. Never operate the transmitter with any other than the recommended fuse in the primary circuit. The fuse will protect your equipment, in the case of accidental contact with the high voltage, it may save your life. If children have access to the transmitter, always disable the primary circuit by removing the fuse or the high voltage circuits by removing the rectifiers.

STANDARD WARRANTY

Adopted and Recommended by the Radio and Television Manufacturers Association

The E. F. Johnson Company warrants each new radio product manufactured by it to be free from defective material and workmanship and agrees to remedy any such defect or to furnish a new part in exchange for any part of any unit of its manufacture which under normal installation, use and service discloses such defect, provided the unit is delivered by the owner to us or to our authorized radio dealer or wholesaler from whom purchased, intact, for our examination, with all transportation charges prepaid to our factory, within ninety days from the date of sale to original purchaser and provided that such examination disclosed in our judgment that it is thus defective.

This warranty does not extend to any of our radio products which have been subjected to misuse, neglect, accident, incorrect wiring not our own, improper installation, or to use in violation of instructions furnished by us, nor extend to units which have been repaired or altered outside of our factory, nor to cases where the serial number thereof has been removed, defaced or changed, nor to accessories used therewith not of our own manufacture.

Any part of a unit approved for remedy or exchange hereunder will be remedied or exchanged by the authorized radio dealer or wholesaler without charge to the owner.

This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to assume for us any other liability in connection with the sale of our radio products.

E. F. JOHNSON CO. VIKING II TRANSMITTERS

SPECIAL WARNING

In the Viking II transmitter, reserve grid driving capability has been provided so as to insure adequate excitation on all frequencies and to allow for variations in individual wiring.

The RCA type 6146 beam power tubes used in the final amplifier have a maximum D. C. grid current rating of 4 ma. per tube.

When 6146 tubes have been overdriven it is evidenced by a negative D. C. grid current reading.

The total grid current should not exceed 8 ma. at any time as exceeding this value may possibly damage the tube and will void the guarantee of the tube manufacturer.

DO NOT EXCEED 8 MA. GRID DRIVING CURRENT AT ANY TIME.

A Initial Installation

1. NOTICE! The regulations of the Federal Communications Commission require a suitable license for operation of this equipment. Refer to publications of the Federal Communications Commission or the American Radio Relay League for the latest rules governing station and operator licensing.

2. Be sure to return the enclosed warranty registration card. This will register your transmitter at the factory and ficilitate correspondence referred to by your transmitter serial number.

3. Remove loose packing material and the packages of parts inside of the cabinet. Inspect the transmitter for any indication of damage. Report any damage to the transportation company immediately.

4. The wired Viking II will arrive with shipping supports consisting of wood blocks and a brace for the transformer.
    a. The transformer blocks and cross support piece should be removed.
    b. Remove the bottom plate and the three wood blocks under the chassis.

5. Attach knobs to the shafts. The setscrew may be anchored securely in place (after the knob has been properly positioned) by first tightening down, loosening slightly and retightening. The knob-dials should be put on and positioned as follows:
    a. CRYSTAL - a 10-0 dial. The 0 located on the maximum counter clockwise position.
    b. OSCILLATOR - a 100-0 dial. The 0 located on the maximum capacity (low frequency) position.
    c. BAND - the 160 80 40 20 15 10 dial. The 160 located on the maximum counter clockwise switch position.
    d. BUFFER - a 100-0 dial. The 0 located on the maximum capacity (low frequency) position. The buffer condenser can be seen through the perforated bottom.
    e. DRIVE - a 10-0 dial. The 0 located on the maximum counter clockwise potentiometer position.
    f. CW-PHONE - a single marker dial. The marker located on CW with the switch in the counter clockwise position.
    g. FINAL - the large spinner knob. No special positioning is required.
    h. 160 - a single marker dial. The marker located on OUT with the switch in the counter clockwise position.

5. i. COUPLING - the 7-1 dial. The 1 located on the maximum counterclockwise switch position. (maximum capacity position)

j. FINE COUPLING - a 100-0 dial. The 0 located on the maximum capacity position of the variable condenser.

k. AUDIO - a 10-0 dial. The 0 located on the maximum counterclockwise potentiometer position.

l. METER - the MOD PLT GRID BFR OSC OFF dial. The OFF position located on the maximum counterclockwise switch position.

6. Insert tubes as follows (the socket locations can be determined from the designations by referring to Figure 1 at the rear of this book):

a. The 6AQ5 buffer in X5 with a 2 1/4" shield.

b. A 6AU6 oscillator in X6 with a 1 3/4" shield.

c. A 6AU6 speech amplifier in X1 with a 1 3/4" shield.

d. A 6AU6 audio driver in X2 with a 1 3/4" shield.

e. The 6AL5 bias rectifier in X11, no shield.

f. The 5V4G L.V. rectifier in X10.

g. Two 5R4GY H.V. rectifiers in X8 and X9.

h. Two 807 modulators in X3 and X4, connect plate caps. The polarity of the caps with respect to the 807 will be determined later.

i. The 6146s in X7 and X17 attach plate caps.

j. The 6AQ5 screen voltage regulator into X28.

The Viking II should now be ready for its initial operation but do not attempt to turn it on until the theory of Operation and Tuneup sections have been studied.

NOVICE OPERATION

Current FCC regulations require that operators with Novice Class Amateur Operator's Licenses limit their final amplifier input to 75 watts, This may be accomplished with good efficiency by reducing output coupling.

In the "plt" position of the meter switch, the meter indicates 6146 cathode current, the sum of plate and screen grid currents. With 6146 grid current at 6 ma. and the amplifier resonant drawing 140 ma. cathode current, the screen current will be 30 ma. and the net plate current will be 110 ma. This is slightly less than 75 watts input with 660 volts plate voltage. Amplifier output can exceed 55 watts under these conditions.

E. F. JOHNSON COMPANY
WASECA, MINNESOTA

240-102-2 WIRED VIKING II TRANSMITTER
SPECIAL SETTING-UP INSTRUCTIONS

1. Remove all packing materials and accessories from inside the transmitter including the transformer shipping braces. (Pull nails from braces, slide blocks toward front panel. The long brace may then be turned slightly and lifted out.)

2. Remove bottom plate and take out the three wood blocks. (Do not yet replace the bottom plate.)

3. Install 6146 tubes in sockets X7 and X17 and install plate caps. (Reference figure 9 in instruction manual.) Check to see that all tubes are seated in their sockets and with shields and plate cap connectors in place. Shields are not used for V28, 6AQ5 screen regulator nor V11, 6AL5 bias rectifier.

4. Attach knobs to shafts per instructions on pages 3 and 4 of operating manual.

5. Initial checks should now be made, using if possible, a dummy load. A standard 100 watt lamp will serve very well for this purpose. Connect the center contact of the lamp to the center contact of J3 (refer to figure 10 of manual). Connect the shell of the lamp base to the ground terminal adjacent to J3.

6. With the line cord connected to a 117 volt 60 cycle power source and before installing a crystal or VFO, turn on the low voltage supply (left hand toggle switch on front panel).

7. Oscillator current should rise to between 17 and 23 ma. Set the "drive" control at mid-position. "Buffer" current will be observed to rise to a high value then fall back. The decrease in "buffer" current indicates that the bias rectifier is now warmed up and it is safe to apply the high voltage.

8. Screen voltages for the 6146 amplifiers V7 and V17 and for the 807 modulators V3 and V4 have already been adjusted by means of the tap on R13 and the potentiometer R30 (adjacent to L10). DO NOT CHANGE THESE ADJUSTMENTS UNLESS THE TEST UNDER STEP 9 FOLLOWING INDICATE IT IS NECESSARY.

9. Switch the phone/CW switch to the CW position. Turn on high voltage (right hand toggle switch)and observe "plt" current. The plate current should be less than 25 ma. It may prove to be as low as 10 ma. however and this is quite normal. Should the "plt" current exceed 25 ma. turn high voltage switch off at once. (There will be no output during this test.)

10. If the "plt" current in step 9 exceeds 25 ma. readjust the screen voltages per the instructions on page E following.

11. With plate current normal as in step 9, you are now ready to proceed with the tuning instructions beginning on page 9 of the instruction manual.

12. The transmitter is normally tuned in the CW position. When the transmitter is delivering full output and the excitation to the 6146s is 6 ma. it will exceed 8 ma. when the high voltage is switched off. Therefore when making tuning adjustments on CW always reduce drive when the high voltage is cut off.

13. After thoroughly testing the transmitter, replace the bottom plate and secure all screws.

Modification A for
Viking II Transmitter

The purpose of this modification is to stabilize screen voltage applied to the 6146 final amplifier. Operating on CW and with key up, the 6AQ5 regulator permits screen voltage to rise only slightly keeping the 6146 cathode current at very near cut-off (10 ma.). While operating on phone and in the event of an excitation failure, the 6146 cathode current will drop to approximately 25 ma. Thus the 6146s are completely protected even though the power line voltage may vary widely. A further advantage of the modification is improved transmitter output under conditions of low line voltage.

Theory of operation of the screen regulator is as follows. The 6AQ5 is used as a triode with its screen grid and plate connected together to the source of 6146 positive screen voltage. The cathode of the 6AQ5 is connected to the center tap of the high voltage transformer (B-). A 470,000 to 500,000 ohm resistor and 1 megohm potentiometer are connected in series between the now single slider on the voltage divider R13 and the most negative point of the bias supply at the junction of choke L6 and resistor R24. The grid of the 6AQ5 regulator is connected to the movable arm of the 1 meg potentiometer. Thus by adjusting the potentiometer any desired grid voltage can be applied to the regulator.

When operating on CW with key down, the regulator tube has cut-off bias applied and draws no current. When the key is opened there is no longer any 6146 grid current flowing thru resistor R24 and the voltage at the junction of L6 and R24 becomes less negative. This results in the grid bias of the 6AQ5 regulator shifting in a positive direction. This positive shift causes the 6AQ5 to draw current applying a load at the source of 6146 screen grid voltage, holding the voltage down even though the 6146 screen grid current has dropped essentially to zero. Should the excitation to the 6146s fail, while operating on phone, the same change in grid voltage occurs and 6146 screen voltage is again restrained. Modulation of the 6146s doubles their screen voltage on peaks but the 6AQ5 bias is sufficiently high so that it remains cut-off.

Supplement to Operating Instructions
Viking II Transmitter
(Modification A Incorporated)

Screen Voltage Adjustment

Instructions for tuning exciter stages remain unchanged. The following adjustments may be made on any band. While it is possible to perform the following operations with the transmitter loaded into an antenna, a 100 watt lamp, used as a dummy load will eliminate the possibility of tuning difficulties and provide visual output indication.

1. Turn the shaft of the 6AQ5 bias control R30 to its full counter-clockwise position.

2. Loosen the tap on the voltage divider R13 completely and adjust its position to between 1 3/4 and 2 inches from the rear end terminal.

3. With the transmitter on the CW position tune the exciter and adjust drive for 6 ma. grid current. Turn the drive control back counter-clockwise to zero.

4. Switch to the phone position, turn on the high voltage, set the coarse coupling control to 1, the fine coupling control to zero. (If these tests are made at 14 mc. or higher frequency, start with the coarse coupling switch on position 7.) Advance the drive control clockwise until the final amplifier current is 100 ma. Starting with the main tuning dial at zero, tune the amplifier to resonance, the first dip in plate current.

5. Advance the drive control for 6 ma. grid current. Load the amplifier to 230 ma. plate current by means of the coupling controls, bringing the amplifier back to resonance (minimum plate current) by means of the main tuning dial after each coupling adjustment. Reset drive control for 6 ma. grid current when the plate current is exactly 230 ma.

6. Now note the modulator cathode current with the audio gain control in the counter-clockwise position. This current should be between 70 and 80 ma. If the modulator current is less than 70 ma., loosen the tap on R13 (REMOVE ALL VOLTAGES FIRST) and move it toward the rear about 1/8" at a time. If the current is more than 80 ma., move the tap toward the panel.

7. After having estabilished the modulator current between 70 and 80 ma., with grid current at 6 ma., PA current at 230 ma., switch the high voltage off, switch to the CW position. Turn R30 to its full clockwise position, open the key, turn on the high voltage.

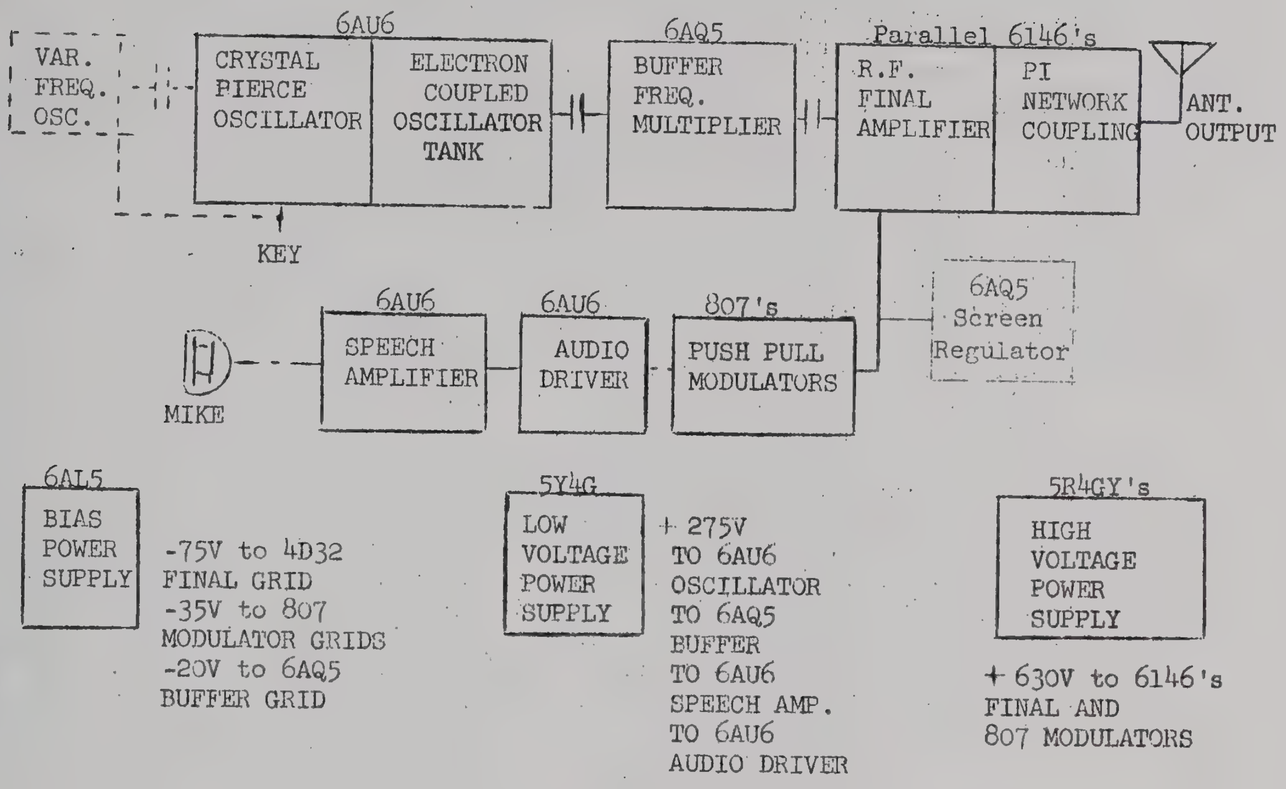
8. BE CAREFUL AT THIS POINT SINCE FULL VOLTAGE IS APPLIED! Switch the meter to read plate current. Turn R30 in a counter-clockwise direction until current rises perceptibly, adjust to 10 ma., the first mark on the meter scale above zero.

9. Switch back to the phone position, turn the crystal selector switch to another position thus removing drive from the final amplifier. Amplifier current should now drop to less than 50 ma.

10. This completes adjustment of screen voltages. They should remain stable over long periods and need not be changed even though the line voltage varies widely. The transmitter may now be used according to previous instructions the only differences being lower static plate current under key up conditions or with no amplifier excitation on phone. For CW operation the power amplifier may be loaded to any cathode current up to 300 ma. For phone operation cathode current should be limited to 230 ma.

B Theory of Operation

1. The Viking II block diagram



2. The general specifications, frequency coverage, and main features of the Viking are covered in the Brochure at the front of this book.

3. The OSCILLATOR: The "crystal" switch will select any of 10 crystal positions on the crystal board or connect the 6AU6 grid to the VFO receptacle at the left rear of the chassis (the VFO is the 0 position). The Pierce Oscillator part of the 6AU6 will oscillate efficiently with most crystals in the range of 1.75 mc to 7.5 mc. The plate of the 6AU6 is electron coupled to the oscillator which makes this stage a good frequency doubler on the high frequency range of the Viking II. The tuning range of the oscillator tank is that of the indicated wavelength on the 160, 80, and 40 meter positions; is the 40 meter range on the 20 and 15 meter switch position; and 20 meter range on the 10 meter bandswitch setting. The approximate frequency coverage of either the oscillator or buffer stage can be determined from the tuning curves on the sheet following page 14. Oscillator cathode current is indicated on the "osc" position of the meter switch. A drop in oscillator current can be expected when a crystal is

3. switched into the oscillator circuit. The Viking II oscillator stage becomes simply an amplifier or frequency multiplier when a VFO is used. It is necessary to isolate the Viking II 6AU6 oscillator grid with a blocking condenser of 50 mmfd to 150 mmfd in the connection between the Viking II and the VFO if a DC path exits in the VFO output. (Not required when using the Viking VFO.)

4. The BUFFER: Frequency multiplication takes place in the 6AQ5 buffer stage on the 20, 15, and 10 meter band positions. Straight through operation is used on all lower frequency bands. The buffer stage output magnitude is controlled by the "drive" screen grid potentiometer control. Buffer tuning is best indicated by the 6146 final "grid" current, while the oscillator tank tuning is best indicated by the buffer cathode current read in the "bfr" meter switch position. The "grid" current must be held below 8 ma. at all times. 6 ma is adequate to drive the 6146s to full output. Buffer no signal current is limited by a fixed bias of approximately 25 volts applied to the 6AQ5 grid.

5. The R.F. POWER AMPLIFIER: The grid circuit of the final 6146 has a fixed bias of 75 volts with an additional 20 to 30 volts of self bias added by the drive signal. Under no-signal conditions the 6146s are almost completely cut off. The tank of the 6146s is part of a pi network matching-coupling circuit. The main tuning inductor, L9, and geared condenser, C29, tune the range of 80 through 10 meters. The "160 in-out" switch adds an additional auxiliary coil to cover the 160 meter band. Frequency coverage is shown on curve 1 of the sheet following page 14. The screen and plate current of the 6146's is read in the "plt" meter switch position. Note that the final grid current is not included in the "plt" reading. The screen grid voltage of the 6146's is obtained from the high voltage supply through a 20,000 ohm series dropping resistor.

6. The PI NETWORK ANTENNA COUPLING: The complete pi network consists of the main tuning inductor, L9, as the series element; the main tuning condenser, C29, as the input shunt element; and the output shunt capacitance made up of a variable condenser, C30, labeled "fine coupling" and a group of fixed mica condensers, C33 through C38, switched in parallel with C30 by a switch labeled "coupling". This combination provides a continuous output capacity range of 20 to 2050 mmfd. The pi tuning-coupling network is designed to match the 6146's into antenna resistances of nominally 50 to 600 ohms and tune out several hundred ohms of antenna reactance over the frequency range of the Viking II. The range of antenna impedance matching extends roughly from 25 to 2000 ohms at frequencies higher than 7.0 mc. In general high impedance loads will require small output coupling capacities (advanced settings). Reactance cancellation take place automatically when the "final" control is tuned to the proper plate current dip with the meter switch in the "plt" position. The net tank plate reactance is dependent on the load characteristics and the output coupling capacity but the plate current dip indicates that the 6146 plates are loading into a resonating tank. The plate current dip becomes less and less pronounced until the final 6146's are properly loaded. A dip of about 15 to 20 ma should always be maintained when the final is properly loaded. Advancing the coupling controls beyond the 20 ma dip point usually causes over-coupling resulting in inefficiency and poor harmonic suppression.

7. The MODULATOR: The modulator consists of a pair of 807's operating in class AB2 push-pull, driven by a transformer coupled 6AU6 driver, and a 6AU6 resistance-capacitance coupled speech amplifier. The "audio" gain is a potentiometer control of audio input to the driver stage. Negative feedback between the modulation transformer secondary and the cathode of the driver stage does much to correct transformer distrotion, minimizes audio resonance tendencies, and allow a degree of overmodulation limiting by the saturation characteristics of the audio transformer with a minimum of distortion. When the "cw-phone" switch is in the "cw" position the secondary of the modulation transformer is shorted and the screens of the 807 tubes are opened. The "phone" position removes the short and applies screen voltage from the high voltage bleed-divider tap to the 807's. Sections of the high voltage primary "plate" switch and the "cw-phone" switch are interconnected in the keying circuit so that the keying circuit is opened whenever the "plate" is off and the "cw-phone" switch is in the "phone" position. This eliminates oscillator interference while listening to a station operating on the same frequency as the Viking II. Frequency response provides excellent quality with ordinary crystal communication microphones.

8. The POWER SUPPLIES: The Viking II has three separate power supplies:

a. The 6AL5 BIAS SUPPLY furnishes approximately 75 volts bias to the 6146 grid circuit, 35 volts bias to the 807 modulator grids and 25 volts bias to the 6AQ5 buffer-frequency multiplier.

b. The 5V4G LOW VOLTAGE SUPPLY furnishes power to all filaments and 260 to 280 volts (loaded) to the RF exciter and 6AU6 audio amplifier stages. The L.V. power transformer is rated at 95 ma. D.C. at the high potential terminals.

c. The HIGH VOLTAGE SUPPLY furnishes 620 to 660 volts (loaded) to the 6146 final amplifier and 807 modulators. The parallel 5R4GY tubes and 10 henry choke input filter provide good regulation in the operating range of the Viking II. The B-side of the H.V. supply is above ground potential by the 6146 meter shunt voltage (100 millivolts full scale).

d. 6AQ5 SCREEN VOLTAGE REGULATOR: This tube prevents excessive rise of 6146 screen grid voltage with key up on CW or in the event of an excitation failure while operating on phone.

9. METERING: The cathode currents of the oscillator, buffer, and modulator may be read on the meter when the meter switch is placed on the indicated position. The 6146 power amplifier combined screen grid and plate currents are read in the "plt" position, and the 6146 grid current is read in the "grid" position. All shunts are cut for 100 mv drop for a full scale meter indication. The "osc" or "grid" currents are read on the lower 0-25 ma scale, the "bfr" current on the upper scale (assuming 50 ma full scale), and the "plt" and "mod" current on the ma 0-500 upper scale.

10. KEYING of the VIKING II is done in the 6AU6 oscillator cathode circuit. The keying circuit is broken by the H.V. switch (off position) on phone operation as previously described under "Modulator", so the RF exciter tune up must always be done in the "cw" position of the cw-phone switch. As may be expected with any conventional oscillator keying, the quality of the

10. keyed character may depend slightly on the oscillator tank tuning when "straight through" operation is used. The oscillator tuning control can be adjusted for clean stable keying.

11. VFO EXCITATION: The "O" position of the crystal selector switch connects the VFO receptacle at the rear of the chassis directly to the 6AU6 oscillator grid through approximately one foot of RG59U cable. An isolating condenser of 50 to 150 mmfd is necessary between the VFO and Viking II input unless the VFO has a capacity coupled output (the Johnson VFO may be directly coupled). 6 volts of 40 meter RF at the grid of the Viking II 6AU6 oscillator stage will drive the final to full excitation on 10 meters. The lower frequency bands require less VFO output. The VFO frequency range should be nominally the same as the crystal frequencies which would normally be used. There is a danger of overdriving the 6AU6 with a VFO. Grid blocking actually reduces the effectiveness of the stage to the point where it attenuates the input signal greatly rather than passing or amplifying the input signal or generating the required harmonics.

When the Viking II is fed with a VFO, it is well to remember that the specified voltage is that at the Viking II 6AU6 grid and that a transmission line must be loaded in a manner to provide the required voltage at the grid of the 6AU6. An example of this problem is a four foot length of RG59U. It will appear as approximately 85 mmfd of shunting capacity at the VFO output and should be treated as such at frequencies below 10 mc unless excessive VFO output is available and the attenuation of the transmission line is desired.

The VFO must be shielded enough so that feedback does not exist between the transmitter and the VFO. Monitoring a VFO driven transmitter should be done more carefully than usually necessary with crystal operation. Keep the VFO and transmitter decoupled from the monitoring receiver to avoid overloading the receiver. Receiver blocking or local oscillator shift due to overloading often causes an unreliable indication of transmitter keying or frequency.

12. The VIKING II as an EXCITER for a LARGER TRANSMITTER:

a. When the Viking II is used as an RF exciter only, tuning and loading procedure will be essentially the same as used with normal transmitter operation. The output of the Viking II can be link coupled to the grid stage of the power amplifier. Enough power should be required at the power amplifier grid circuits to load the Viking to at least 30 watts. Shunt dissipating resistors can be added if the grid requirement is too small to load the Viking II sufficiently.

b. Conversion of the Viking II Modulator to serve as an audio driver is shown on the following sheet. Figure A suggests how a switch or transfer terminal board may be used to connect the Viking II modulator to drive the grids of a larger modulator directly and allow normal Viking II operation upon switching or moving the transfer jumpers to the alternate position shown. Figure B shows the connections for feeding the larger modulator grids through a 500 ohm line and audio driver transformer. A hole may be punched

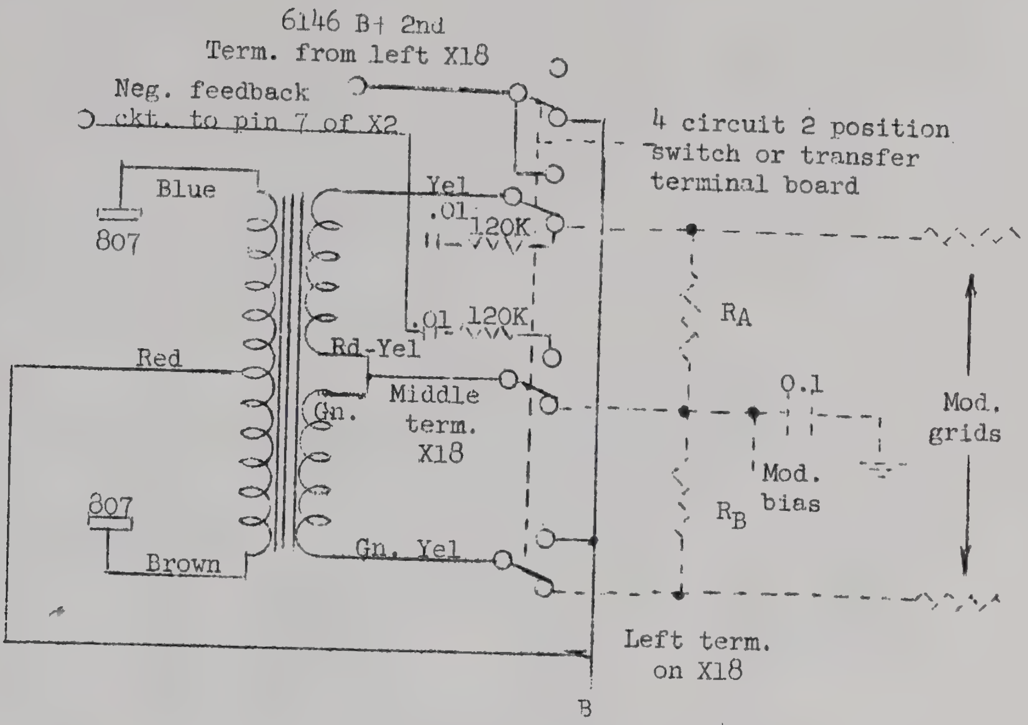


FIGURE A
DIRECT GRID CONNECTION

The 500 ohm Modulator driver connections are shown in FIGURE B on the other side of this sheet.

VIKING II MODULATION TRANSFORMER CONNECTED TO DRIVE A LARGER MODULATOR WITH SWITCHING OR TRANSFER FOR NORMAL OPERATION

1. Refer to Figure 2 at the rear of the book for terminal locations. The yellow and gn-yel modulation transformer leads in Figure a and the yellow and rd-yel leads of Figure B must be disconnected from present terminations.

2. A 4 circuit 2 position switch may be mounted on the side of the chassis above X4 or a transfer terminal block may be mounted on the outside rear of the chassis. No attempt will be made to provide mounting details as available switches or terminal boards will differ markedly. Steatite switches or terminal boards should be insulated for 1200V between terminals.

3. R_A, R_B, or R_C may be chosen to load Viking II Modulator if quality is impaired by light loading.

4. Negative feedback components, R9 and C5, shown in the Viking II schematic, must be replaced by those shown in sketches.

5. Permanent connections for exciter operation can be made as indicated by the closed circuits in the switch positions shown above, eliminating the switch or transfer board.

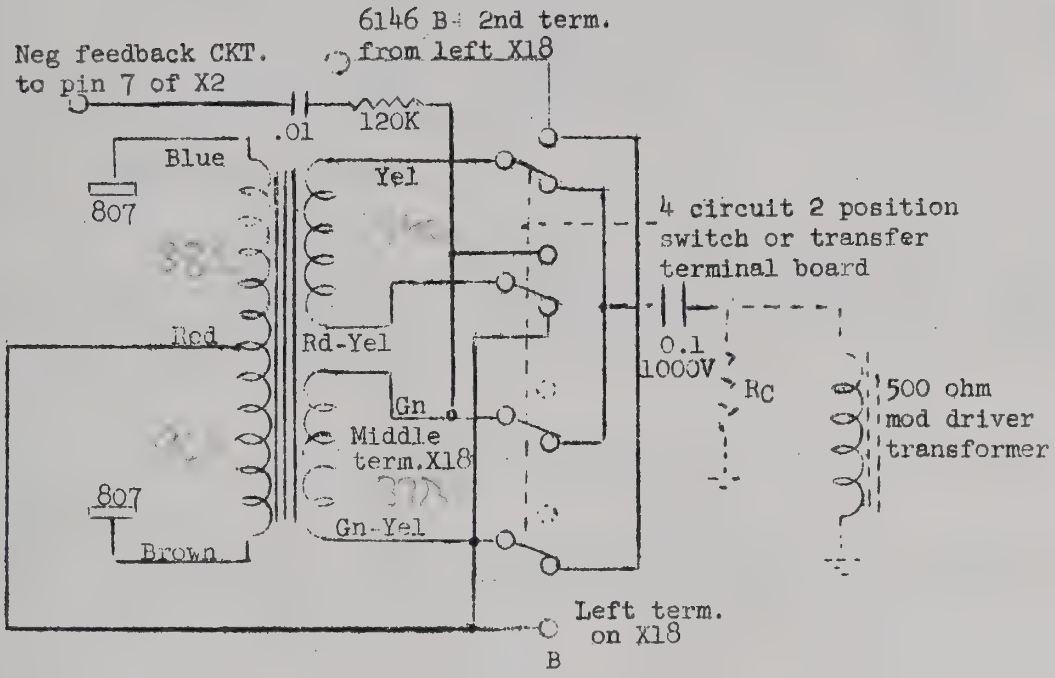

6146 B+ 2nd term. from left X18
Neg feedback CKT. to pin 7 of X2
.01
120K
Blue
807
Yel
4 circuit 2 position switch or transfer terminal board
Red
Rd-Yel
0.1
1000V
Rc
500 ohm mod driver transformer
Gn
Middle term.X18
807
Gn-Yel
Brown
Left term. on X18
B

FIGURE B
CONNECTION THROUGH 500 OHM PRIMARY
OF MODULATOR DRIVER TRANSFORMER

12. b. in the rear of the Viking cabinet to bring out the audio leads conveniently either directly or through an appropriate connector.

c. Connection of the Viking II as an audio driver in a permanent installation suggests itself in Figures A and B. The switches are shown in the driver exciter position; permanent connections can be made ignoring the alternate normal Viking II operating position. The secondary winding of Figure B may be isolated from B+ and grounded which will eliminate the need of the 0.1 mfd D.C. isolating condenser.

13. a. ANTENNA RELAY OPERATION

The twin ceramic terminals on the rear of the chassis provide 115V AC for operation of an antenna relay. The terminals are energized only when switch SW2 (high voltage switch) is "on". The antenna relay coil or other load connected at this point must be insulated from ground. Fuse F1 protects the circuit from accidental overload.

C Viking II Tuning Details

1. TYPICAL TUNING: 40 METER tuneup procedure will serve to acquaint the operator with the usual steps involved. Deviations of procedure for other bands will follow.

a. Connect a good ground wire or counterpoise to the ground terminal at the rear of the chassis. If there is some question of ground effectiveness read the section "How to Obtain a Good Ground" under the Pi Network tuning and Harmonic Suppression topic on page 16. Connect an antenna or dummy load to the output receptacle at the rear middle of the chassis.

b. Plug in a 7.00 to 7.30 mc crystal in position 1 of the crystal selector socket. 3.5 to 3.65 mc crystals are usually very satisfactory, 1.750 to 1.825 mc crystals may be used but with caution as it is possible to obtain output at 5.250 to 5.475 mc.

c. Set the "crystal" dial on "0".

d. "Band" on "40".

e. "Drive" on "0".

f. "Final" on "0" (Full tank in).

g. "CW-phone" on "cw".

h. High voltage "plt" bat handle down.

i. "Coupling" on "1".

j. "Final Coupling" on "0".

1. k. "160" switch on "out".

l. Approximate settings of the oscillator and buffer may be obtained from tuning curves on the sheet following page 10.

m. Throw "fil" switch SW1 on. This applies to all voltages except plate and screen voltages for the 6146 final and 807 modulators.

n. Turn "crystal" to position 1. The "osc" current should drop perceptibly.

o. Turn "meter" to "bfr" and advance "drive" to about position 4 in the clockwise direction.

p. Tune "oscillator" slowly for a rise in buffer current. Adjust tuning for buffer current. In some cases a slight dip of buffer current may occur between two maximum current points. This is true with very active crystals or a strong 6AU6 oscillator tube. Correct tuning, when this occurs, is usually on the dip between the maximum points.

q. Turn meter to "grid" and note 6146 grid current. If it should be over 8 ma, reduce it at once by turning "drive" counterclockwise. Usually there would be no grid current at this point but the buffer tuning could happen to be nearly correct.

r. Tune "buffer" for maximum grid current keeping the grid reading below 8 ma by means of the "driver" control. After "buffer" has been properly adjusted, turn "drive" to its 0 position.

s. Turn meter to "plt" position and "plate" on. Turn "drive" clockwise until plate current rises to 100 ma.

t. Tune final toward 100 until plate current dips sharply. Be certain that the final is tuned to the first dip in plate current thus assuring that the amplifier is tuned to the fundamental and not to a harmonic.

u. Turn meter to "grid", and touch up buffer tuning for maximum grid current. Advance "drive" until 6 to 8 ma of grid current is noted. Turn meter to "plt".

v. Proceed to load the antenna by advancing the "coupling" control toward higher numbers until the "plt" current is around 200 ma. Retune "final" for a dip and again advance "coupling" and retune the "final" for dip until around 200 ma or slightly less is again read under resonant conditions.

w. A minimum coupling capacity equivalent to that of step 6 of "coupling" should be maintained in any case on 40 meters. The antenna is usually out of the range of the Viking II if less than a total of 150 mmfd of output capacity is required on 40 meters. If "coupling" is turned to 7, "fine coupling" should be advanced no further than 60 on 40 meters in step x.

1. x. Turn "fine coupling" toward high numbers until the "plt" reading rises to about 250. Dip the plate current with "final" adjustment again and follow this procedure until a desired plate current between 250 and 300 has been reached. A slight broad dip of 15 to 30 ma should be maintained when tuning is complete. Complete lack of a dip indicates over-coupling with accompanying inefficiency and poor harmonic rejection. If the desired coupling cannot be obtained with the "coupling" setting of step w, turn the "fine coupling" to 0 and advance "coupling" another step (normally not beyond 6 on 40 meters) and readjust "final" and "fine coupling". Cathode current on CW should not exceed 300 ma.

C.W. OPERATION may now be carried on by simply plugging in the key. Check to be sure the 6146 plate current is not over 25 ma with the key up before operating. If keying is slightly erratic, retune the "oscillator" slightly until keying is crisp and clean.

2. 160 METER TUNING: Proceed as on 40 meters with the following exceptions:

a. "160" switch on "in" (do not turn until "plate" is off).

b. Use 1.8 to 2.0 mc crystals in crystal socket position corresponding to "crystal" setting.

c. Final tuning will be very broad. With high impedance antennas the "final" may be against the stop on the "0" end when resonance is indicated. In this case leave the main dial at "0" and advance "coupling" toward higher numbers. Do not advance "coupling" beyond 6 the "fine coupling" beyond 50 in any case. A further reduction in output capacity indicates that the antenna terminal impedance is out of the range of the transmitter. Although you may feel the tank is out of resonance, the circuit is so broad that good resonance conditions still exist and its efficiency is not impaired.

3. 80 METER TUNING:

a. "160" switch on "out" ("plate" off while changing).

b. Use 1.75 to 2.0 mc or 3.5 to 4.0 mc crystals.

c. Do not attempt to reduce "coupling" beyond step 6 nor "fine coupling" beyond 50 in cases of high antenna impedance again as in the case of 160 meter tuning.

4. 20 METER TUNING:

a. 7.0 to 7.2 mc, or 4.666 to 4.8 mc (14.0 to 14.4 mc harmonic) crystals may be used. 3.5 to 3.6 mc and 1.750 to 1.8 mc crystals may be used but caurion must be exercised as it is possible to obtain output at 10.5 to 12 mc. Reduced drive will be noted with the latter crystals.

b. In nearly all cases of 20 meter operation the "coupling" switch can be set at 7 and loading accomplished by "fine coupling" alone. The "fine coupling" should never be advanced beyond a setting of 70 for 20 meters with "coupling" at 7.

5. 15 METER TUNING:

a. 7.0 to 7.15 mc crystals are preferred. 3.5 to 3.575 mc crystals may be used with limited 6146 grid drive.

b. Set "coupling" at 7. the "fine coupling" control should never be advanced beyond 80 in any case on 15 meters.

6. 10 and 11 METER TUNING:

a. 7.0 to 7.425 mc or 6.74 to 6.8075 mc crystals are recommended. 14.0 to 14.85 mc or 13.48 to 13.615 mc crystals (usually harmonic cut but oscillate at 1/3 of their indicated frequency in the Viking II) may be used with somewhat lower final drive. 3.5 to 3.7125 mc crystals will drive the final (5 to 8 ma grid current) but caution is necessary as 24.5 to 25.987 mc output is possible.

b. Set "coupling" at 7. Do not advance "fine coupling" beyond 90.

c. Touch up tuning. Final will have setting near 100.

If difficulty is experienced in obtaining a "grid" indication on the 10, 11, and 15 meter bands due to weak crystal activity or double peaks on buffer current tuning, the "plt" current may be used to determine the initial settings as follows (this procedure is rarely needed as the Viking is normally very easy to tune on these bands):

a. Tune oscillator stage as usual for maximum buffer current.

b. Turn "drive" to 0.

c. Turn "meter" to "plt".

d. Turn "plate" switch on.

e. Turn "driver" up to about 4 while watching the plate current.

f. Tune buffer and oscillator to maximum plate current, limiting the "plt" reading to 100 ma by means of the "drive" control during tuning. Do not leave "plate" on while final in untuned for periods of more than 1 minute.

g. Turn "plate" switch off and check "grid" current. Log settings if difficulty is anticipated in retuning under the same conditions.

7. PHONE OPERATION:

a. Tune up Viking II in "cw" position.

b. Turn the "plate" switch off.

c. Turn "phone-cw" switch to "phone", adjust for 6 ma grid current, 230 ma. "plt" current (Cathode current should not exceed 230 ma for phone operation).

d. Turn "audio" to "0".

e. Turn "plate" on. If squeal is heard, turn "plate" off immediately and reverse 807 plate caps. Before doing so, be sure the high voltage is off by shorting plate caps to transformer case with an insulated screwdriver!

7. f. Connect a high impedance crystal or high output dynamic microphone to the connector marked "mic".

g. Turn meter switch to "mod". The modulator no signal current should be between 60 to 80 ma.

h. Talking into the microphone, advance audio until the "mod" current rises to 150 to 175 ma on audio peaks. 150 to 175 ma of modulator current corresponds to 100% modulation. Antenna current will advance 15 to 20% with 100% sustained modulation. Do not tone modulate the transmitter near full modulation for periods of more than two minutes as the power supply loading will be excessive. A small downward reading of "plt" is normal during modulation.

i. Check 6AQ5 screen regulator adjustment by switching crystal out of the oscillator circuit momentarily. "Plt" current should drop to less than 50 ma.

8. VFO OPERATION:

a. Review the discussion of VFO excitation under "Theory of Operation".

b. Plug the VFO output cable to the VFO coax receptacle at the left rear of the Viking II chassis. A 50 to 150 mmfd isolating condenser may be needed in the center conductor of the connecting cable to prevent the 6AU6 grid from being short circuited if the VFO output has a continuous D.C. path to ground. (The isolating capacitor is unnecessary when the Viking VFO is used.)

c. Use the VFO in the same manner as crystals are used for output on the band selected. Only two volts of 160 meter signal at the Viking II 6AU6 grid will drive the transmitter to full output on 160 to 80 meters. The 160 meter VFO signal will also drive 40 meters satisfactorily. Six volts of 40 meter VFO excitation at the 6AU6 grid will be sufficient to drive the Viking II to full output on all bands, 40 meters through 10 meters. The R.F. Voltage at the 6AU6 grid should be limited to a value of less than 15 to 20 volts to prevent the stage from blocking.

d. It should be borne in mind that any tendency of a VFO to chirp or drift is multiplied when the transmitter's output frequency is two, three, or four times the V.F.O. output.

e. Zero beating a received signal in cw operation is accomplished by simply closing the key (with "plate" off) and adjusting the VFO for a zero beat with the received signal in the receiver. If the coupling of the Viking II exciter stages to the receiver is so close that the receiver tends to block, the exciter stage can be disconnected from the VFO by tuning the "crystal" switch to the #5 or #6 vacant crystal positions while adjusting the VFO. (Enough VFO coupling takes place in the #1 and #2 position to excite the 6AU6 somewhat)

f. Zero beating signals in phone operation is done by turning the "phone-cw" switch to "cw" and proceeding as described previously. In cases of very weak signals the receiver BFO may aid in making the VFO zero beat setting.

D Viking II Pi-Network Tuning and Harmonic Suppression

The pi tuning/coupling network in the Viking II is designed to load the final amplifier into antenna resistances of nominally 50 to 600 ohm throughout its frequency range. In addition, it is capable of "tuning out" series antenna reactances up to several hundred ohms to complete a good match to most unbalanced antenna systems. The range of antenna impedances which may be matched by the pi network at frequencies higher than 7.0 mcs. extends from roughly 25 to 2000 ohms.

When the transmitter is well grounded and properly tuned, the harmonic suppression is excellent, generally much better than other conventional methods of antenna coupling. This should be of interest to amateurs afflicted with TVI or other high frequency interference problems.

1. Importance of grounding:

To obtain proper tuning, coupling and harmonic suppression with any transmitter antenna coupling system, the part of the circuit designed to operate at RF ground potential must be at RF ground potential. A "room full of RF" is evidence that a high RF potential exists on something in or near the room. In many cases the source of RF is the transmitter's chassis and power cord. This condition is very undesirable for several reasons. The power cord is very closely coupled to the chassis by the electrostatic shields of the power transformers. Three objectional factors which obviously affect the loading of the transmitter when poor grounds are involved are:

a. The impedance that the output terminal of the transmitter looks into includes not only the true antenna to ground impedance as presented by the antenna feedline but also the transmitter chassis to ground impedance. This additional impedance in some cases will raise the apparent antenna impedance to such a high value that it cannot be loaded by the pi network.

b. Part of the tansmitter's power is lost in the ground system due to radiation of the ground lead, power cord or cabinet. This power is quickly dissipated in surrounding objects and contributes nothing to effective radiated power except to distort the antenna's normal field pattern.

c. It is conventional, in designing a transmitter, to bypass harmonics or any possible sources of stray high frequency currents to the chassis on the assumption the chassis will be kept as near ground potential as possible. When a high impedance is presented to these currents at the chassis they are able to radiate to some extent rather than be passed harmlessly to ground.

2. How to obtain a good ground:

What may appear to be a good ground at one frequency may prove to be a poor ground at another. A single ground lead may have "standing waves" on it due to its length. While it may seem difficult to obtain a good ground over a wide range of frequencies, it can be done and will be well-worth the trouble when increased radiation efficiency, ease of antenna loading and

2. reduced TVI and BCI are considered. There is also reduced danger of damaging microphones, receivers and other associated equipment with excessive RF fields.

Avoid using the "cold" side of the power line, power line conduit or gas lines for RF grounding. Some suggestions which may help to obtain a good ground are:

a. Water pipes or metal building structural members are usually good sources of earth grounds

b. Use heavy conductors (#14 or larger) between the connection at the ground point and the transmitter. Copper ribbon is excellent for this purpose.

c. The use of several ground leads, each of a different length and selected at random may be helpful in keeping grounding impedance low at the transmitter, even though the transmitter is some distance from a true earth ground. The possibility of obtaining an effective ground at any frequency throughout the transmitter's range is quite good. If at any one frequency, one of the ground leads presents a low impedance at the chassis, the chassis is effectively grounded. By changing the length of one of the ground leads experimentally, a good ground can often be obtained at a frequency which has been troublesome. In bringing several leads to the transmitter, small closed loops near the transmitter or antenna feed line should be avoided. Induction fields will tend to raise the impedance of the ground leads.

d. In cases where it is impossible to obtain a good earth ground, connecting the transmitter chassis to some system of conductors having a very low effective impedance to ground compared to the antenna impedance may be helpful. Usually this artificial "ground" takes the form of a system of radial wires spread horizontally on the floor, a gridwork of wires, or a large metal sheet on the floor below the transmitter. To be effective, the minimum area covered by the metal conductors should be roughly equivalent to a square, the length of one side of which approaches a quarter wavelength. This system of "grounding" should be experimented with before committing the location of any permanent installation.

e. A simple counterpoise made up of a single wire attached to the chassis may be helpful. On 10 meters a length of 6 to 8 feet may be attached and the open end cut off 4 inches at a time until the chassis becomes "colder". The open wire may be allowed to drop along the floor although its open end will be somewhat "hot".

f. A rough check on the effectiveness of the transmitter ground may be made by touching the chassis while watching the PA cathode current and grid current with the transmitter operating into its antenna. A change in current upon touching the chassis is indicative of an ineffective ground. If a neon bulb, held between the fingers, can be ignited by touching a contact to the chassis, the RF present is excessive and is another indication of an ineffective ground. In cases where the transmitter is feeding a low impedance antenna, the test by touching the chassis is more reliable since 50 to 60 volts is required to ignite the neon lamp.

3. Loading Random Antennas with the Pi Network:

With the transmitter chassis well grounded, correctly designed antenna systems having relatively "flat" unbalanced feeder systems, can easily be loaded by following the instructions already given, provided the antennas terminal impedances fall within the range of the pi network. Feeding a balançed system with a feedline over a quarter of one wavelength long, may prove to be surprisingly successful if the transmitter chassis is held at ground potential. The transmission line between the transmitter and antenna will tend to assume a partial balance at the antenna. Some standing waves will result but may not be excessive. Methods of changing from an unbalanced to balanced transmission system are discussed in the ARRL Radio Amateurs Handbook and devices for accomplishing this change over the amateur bands are beginning to be available commercially.

Antennas having random lengths, random feed points and various types of feed lines will exhibit widely different resistance and reactance charateristics. It is well to remember that the feedline is a very important part of the system. A common example of the random antenna is a horizontal wire fed by a single wire feed line. The feedline in this case actually becomes part of the radiating system. An antenna of this type can, in most instances, be fed by the pi network directly but there are critical dimensions where the antenna series reactance (inducive or capacitive) becomes too high and the antenna resistance can become either too high or too low to be matched by the pi network.

Antennas with high terminal resistance or reactance can usually be recognized while loading the final stage of the Viking II. The final amplifier is normally loaded by reducing the output coupling capacitor (C30) in small steps, retuning the amplifier to resonance each time. This results in an increase in PA cathode current and is continued until full loading is achieved. If however, a point is reached where decreasing the output coupling capacitor (C30) does not result in a marked increase in PA cathode current and the PA is not fully loaded, the antenna can be assumed to have a high resistance or reactance at this frequency.

Antennas with low terminal impedance (resistance and reactance both low) can usually be recognized by a noticeable lack of coupling condenser effect in the range of settings normally used at the operating frequency. There will be little or no detuning evidenced as the coupling control is changed.

Several things can be tried in an effort to bring the antenna system into the tuning range of the pi network:

a. Change the length of the feeder line between the antenna and transmitter experimentally 1/8 to 1/4 wavelength.

b. Change the point of connection of the feedline to the antenna 1/8 to 1/4 wavelength.

c. Change the antenna length 1/8 to 1/4 wavelength. Antennas shorter than 1/8 wavelength (antenna and feeder) may be difficult to load. They present a high capacitive reactance to the transmitter output terminals.

3. c. Effective antenna lengths in the vicinity of 1/2 wavelengths will in general exhibit characteristics of high resistance, high reactance (inductive or capacitive), or both.

d. "Load" the antenna feeder by placing an inductor or capacitor in series to cancel out the reactance of the antenna feeder. This may require considerable cut and try and will affect only the reactive component of the antenna impedance. However, it can prove useful in some cases.

e. L type matching networks of inductance and capacitance may be used to aid impedance matching. Much discussion of this more elaborate method of bringing the antenna impedance within the range of the pi network could be included, however, the few cases where it is necessary do not justify inclusion herein. Textbook and handbook discussions will be helpful if work along this line is pursued. There is danger of resonating the coupling condenser of the pi network when using an external coil. This should be watched as excessive voltage built up across the coupling condensers can cause damage. Improper coupling or loading will take place under these conditions.

4. Dangers to be avoided and hints which may further aid in harmonic and TVI reduction.

a. When loading high impedance antennas there is a temptation to "squeeze" the last watt into the antenna by opening the coupling condensers as much as possible. Harmonic suppression is dependent, to a great extent on the amount of coupling capacity in the circuit. It is wise to use as much coupling capacity as practical at all times. The proper amount of coupling when the antenna impedance is high, can be conveniently determined by holding a neon lamp against the antenna feeder. The coupling condenser can then be opened until little increase in glow is noticed when the coupling condenser and tuning controls are adjusted for maximum output. A decrease in coupling capacitance beyond this point may cause a higher plate current reading due to reduced plate circuit efficiency. Higher harmonic output will also result as the coupling capacity is reduced beyond the point where the output has leveled off. The random antenna system may present a more favorable impedance to harmonic output than the output on the fundamental frequency; hence it is well to use as much coupling capacity as is practical. It is well to remember that the amount of coupling capacitance needed is dependent on the operating frequency. For example, 2,000 micro microfarads at 3.5 mcs. corresponds to 160 micro microfarads at 28.0 mcs. These are the values necessary to couple resistive loads of less than 50 ohms, at the frequencies stated.

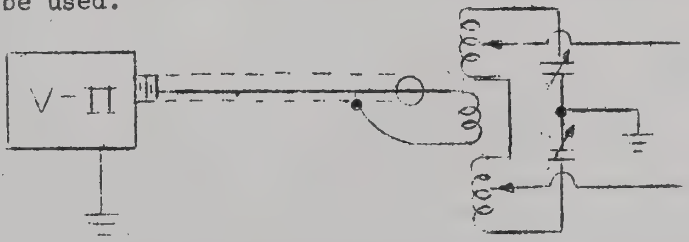
b. The low frequency bands (80 to 160 meters) may present the danger of doubling in the final stage when the antenna impedance is high. If the coupling condensers are reduced to values comparable to the capacity of the tuning condenser (C29) the net plate tuning capacity is reduced, as these condensers are effectively in series, and it becomes very possible to inadvertently tune to the second harmonic instead of the fundamental of the intended output frequency. To avoid doubling in the final, the initial tuning should be done with all the output coupling capacity in the circuit and the final tuning control starting from its zero setting. The first and dip of the amplifier cathode current, as the tuning control is advanced

4. b. from zero setting, is the resonant point for the fundamental output frequency. As the coupling condensers are reduced the tuning control should be reset, toward zero, for minimum cathode current so that the original plate circuit resonant frequency is maintained. Avoid reducing the coupling condenser values below the point where the output levels off as discussed previously. No danger of doubling in the final will occur if the proper tuning method is followed. For some high impedance coupling conditions on the low frequency end of the 160 meter band, much of the output coupling capacity may be out of the circuit as the antenna is loaded and the tuning control may approach the maximum tank capacity setting (dial zero) and tend to go beyond. The amplifier is quite broad on 160 meters and if, under these conditions. the tuning control is left at zero, the output coupling capacity can be reduced slightly more as more output is indicated by a neon lamp or plate current increase. Even though the amplifier seems to be out of resonance, it will still be resonant, unless the output coupling capacity has been reduced excessively, and the efficiency will be quite good.

c. If the power line voltage is low or the high voltage rectifiers have low emmission, the loaded plate current may not reach the normal value. This condition should not be confused with the inability of the pi network to load an antenna system.

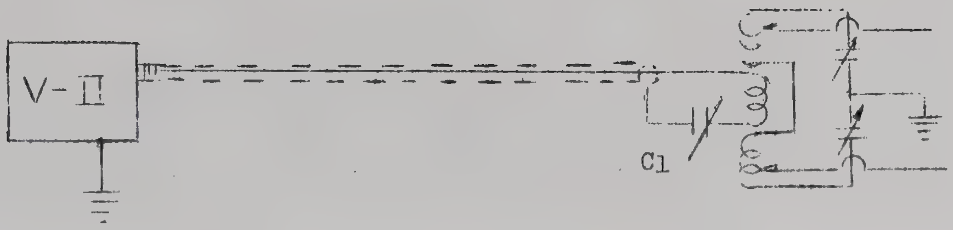
5. Coupling to balanced antennas:

Balanced antennas such as center fed "Zepps", beams and folded dipoles normally use a two wire transmission line and should have equal voltages, 180 degrees out of phase, applied to each feedline terminal. Since the output of the Viking II is single ended, unbalanced, a coupler is required for balanced antenna systems. A simple coupler for this purpose is shown below. The tank circuit is resonant at the operating frequency and can be excited by a coaxial line and coupling link. Line impedance is not critical although 52 ohm line will be most desirable if a JOHNSON Low Pass Filter is to be used.



Feedpoint impedance of the coupler is adjusted by means of the inductor taps. Final amplifier loading is adjusted with the transmitter output coupling controls.

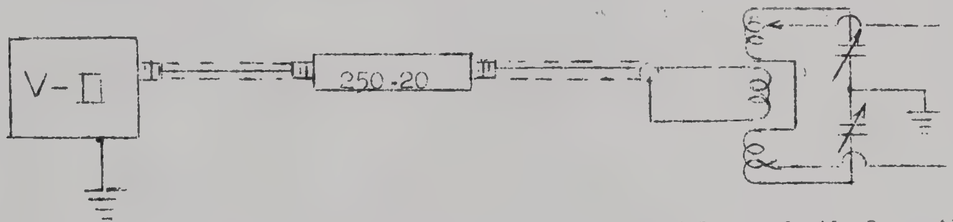
Tuning of the coupler can be made quite broad by making the L/C ratio as high as possible (low "Q") while still permitting the desired loading. Inductive reactance of the coupling link may make it impossible to reduce the SWR of the coaxial line to or below 1 1/2 to 1. If so, the link circuit may be made series resonant by adding capacitor C1 as shown on the following page.



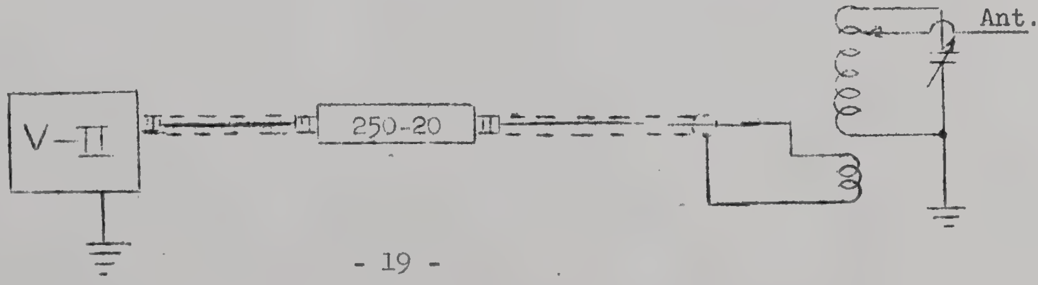
6. Use of low pass filters:

Depending upon how it is tuned, 2nd harmonic attenuation of the Viking II amplifier can be as high as 30 db. Since this will permit operation in many locations without television interference, the JOHNSON 250-20 Low Pass Filter is not an integral component of the Viking II but is available as an optional accessory. This filter will provide an additional 75 db or more harmonic attenuation with insertion loss less than .25 db. Characteristic impedance is 52 ohms, power rating 1 KW.

The low pass filter may be inserted in the coaxial line between the transmitter and the antenna coupler. Coaxial connectors are used at the transmitter and at both ends of the low pass filter to preserve the shielding provided by the coaxial line. It is important that the standing wave ratio on the coaxial line be maintained at 1 1/2 to 1 or less, therefore the impedance of the line between the Viking and the coupling link should be the same as the characteristic impedance of the filter. (The JOHNSON 250-20 is 52 ohms.) The section of coaxial line between the transmitter and the low pass filter should be as short as possible and electrical quarter waves should be avoided. An RF bridge for measuring SWR will prove invaluable for both initial set-up and for operational checks. Construction and application of a simple bridge are covered on pages 486-489 of the 1952 ARRL Handbook.



An end fed half-wave antenna may present loading problems, both from the standpoint that its impedance is higher than can be matched by the pi-network amplifier of the Viking or that the low output coupling capacitance used reduces inherent harmonic attenuation below tolerable values. Therefore the use of a half wave antenna may create TVI problems while other antennas prove perfectly satisfactory. The end fed half wave may be loaded and television interference suppressed by using the following coupling circuit. The coupling tank is resonant at the operating frequency and the unloaded "Q" should be quite high for an antenna an exact half wave long.



E Trouble Shooting

1. SCHEMATICS, PHOTOGRAPHS, AND CHARTS aid greatly in trouble shooting; use them. Part 2 and 3 list typical voltage, current and winding resistance values; individual transmitters may vary somewhat from the values shown but generally no more than 10 to 20%. Parts 4 through 13 list symptoms of trouble and suggestions for their location and cure.

Figures 9, 10, 11, 12, and 13 on the last sheets of this book will facilitate component and wire location in the Viking II.

BE CAREFUL when making HIGH VOLTAGE measurements. DO NOT TAKE CHANCES. Do not depend on the bleeder resistor to drain the high voltage condenser but use a well insulated screwdriver to short any high voltage point to chassis by first grounding the screwdriver to the chassis and bringing the shank to the terminal to be discharged.

All power supplies must be off and discharged before making ohmmeter measurements.

2. Typical Viking II voltages and currents with the 6146 Final loaded into a 50 ohm load:

a. CW operation 115V 60 cycle ac, input voltage measurements made with 20,000 ohm/volt voltmeter.

Frequency 28.868

P.A. screen and plate current ("plt")	300 ma
P.A. grid current ("grid")	6.0 ma
P.A. plate voltage	+660 V
P.A. screen voltage	+175
P.A. grid bias (total)	-97 V (-77 V no sig)
Power output	135 watts
Buffer current	20 ma
Oscillator current	8.0 ma
Low Voltage B+	+320 V
Bias Supply Voltage	-80 V (with 6.0 ma 6146 grid current)
6AQ5 fixed bias	-25 V "
807 fixed bias	-37 V "

✓

6AU6 speech amplifier (socket X1) screen voltage	+ 88 V	(no sig)
6AU6 speech amplifier plate voltage	+ 92 V	"
6AU6 audio driver (socket 2) screen voltage	+ 150 V	"
6AU6 audio driver (socket 2) plate voltage	+ 263 V	"

b. Phone operation with the above input conditions. Only readings which vary significantly from cw operation or apply only to phone operation are recorded. Approximately 30% modulation was applied during measurements.

P. A. screen and plate current	230 ma
P. A. plate voltage	+ 620 V
P. A. screen voltage	+ 185 V
Power output	110 watts (carrier and side bands) 102 watts (no signal)
Modulator 807 screen voltage	+ 360 V
Modulator cathode current	90 ma (75 ma no signal)

The no signal "mod" current should be between 60 to 80 ma. This may be adjusted by moving the tap nearest the rear of the chassis on the high voltage divider R13. (WITH POWER OFF) If the R13 tap is adjusted, R30 should be readjusted.

3. Transformer and choke winding resistances and open circuit voltages.

	Winding	Color of Leads	Resistance	Open ckt ac voltage (112 V 60 cy input)
T1 P1781	115 V pri.	black to black	1.0 ohms	---
	secondary	red to yel-rd	105	865 volts
		yel-rd to other red	96	865
T2 P1893	115V pri.	black to black	2.5	---
	L.V. sec.	red to yel-rd	97	298
		yel-rd to other rd	95	298
	Bias sec.	blue to blue	46	140
	Fil	green to green	less than .1	6.4
	L.V. rect.	brown to brown	.2	5.1
	H.V. rect.	yel to yel	.1	5.2

	Winding	Color of Leads	Resistance	Open ckt ac voltage (112 V 60 cy input)
L1 P1783	H.V. choke		95	
L2 P1501	L.V. choke		280	
L3 P1784	Bias choke		440	Open circuit 1000 cycle inductance
T3 P1503	Audio pri.	red to blue	210	approx 2.6 H
	Sec.	black to yel	110	
		black to green	105	
T4 P1992	Mod. pri.	red to brown	100	1.5 to 1.75 H
		red to blue	95	1.5 to 1.75 H
	Mod. sec.	Gn yel to green	36	(.01 bypass condenser C32 must be disconnected before measuring inductance)
		rd yel to yel	36	

No attempt has been made to anticipate all troubles, operating errors, or component failures in parts 4 through 13, but a few symptoms with a discussion of probable causes may suggest means of analyzing other symptoms related to those mentioned.

NEVER REPLACE FUSE WITH A VALUE HIGHER THAN 5 AMPERES.

4. Fuse blows when "Fil" is turned on:

a. Check 6AL5, 5V4G, 6AU6's and 6AQ5 tubes for shorts between plate and other elements.

b. Look at tube socket terminals and T2 primary ac wiring for shorts.

c. The low voltage B+ may be shorted. An ohmmeter test of the exciter coils to chassis should show approximately 25,000 ohms.

d. If no short is found on the B+ line, check the transformer windings for shorts to ground or shorted turns. Open circuit voltage data may be useful in finding turn to turn shorts.

e. Check X10 wiring also shield of VFO power socket X12.

5. FUSE BLOWS when "plate" is turned on:

a. Check for condensed moisture on 5R4 sockets X8 and X9.

b. Check 5R4, 6146, and 807 tubes for shorts.

c. Check High Voltage B+ line for shorts (violet leads 42,43 and 43 may be conveniently isolated at the H.V. bleeder-divider resistor R13.

5. d. Check H.V. primary wiring and "plate" indicator pilot light.

e. If no ground is found on H.V. B+ line, test H.V. transformer for shorts to ground or winding to winding.

6. R. F. EXCITER:

a. No "osc." current may be due to "cw-phone" switch on phone, key open, 6AU6 filament being open, or no L.V. B+.

b. "Grid current low and "bfr" current low - may be due to a weak buffer or oscillator tube. A few 6AQ5's or 6AU6 may show good emmission in a tube tester but will prove to be poor R.F. amplifiers. Check tuning curves to be certain tuning is near the expected setting. A 6 ma 10 meter grid current is sufficient to drive the 6146's to full output.

c. Key up "bfr" current being excessive may be caused by failure of the bias supply.

d. Erratic keying usually can be corrected by adjusting the "oscillator" tuning. If this does not correct the condition the crystal may be suspected as normally the Viking keys cleanly with most crystals.

e. Failure to oscillate is usually due to the crystal but it may be well to check to position of the "crystal" dial to be certain it corresponds to the crystal socket number.

7. Inability to tune Final:

a. Check position of 160 meter switch.

b. Check for loose connections in the tank and loading circuits.

8. Inability to Load Final:

a. Check ground connections.

b. Check antenna connections.

c. Read discussion on pi network loading.

9. Report of excessive harmonics:

a. Check tuning to make certain doubling is not taking place in the final.

b. Examine antenna to make certain that its efficiency at the harmonic is not many times greater than at the fundamental.

c. Read discussion on Pi Network Tuning and Harmonic Suppression.

d. In checking harmonics, the test receiver must be far from the transmitter as the exciter stages are harmonic generators. Also remember that an

9. d. excessive fundamental signal to the receiver may cause harmonic generation in a receiver stage - hence a false indication may be noted.

10. Report of signals 20 to 60 KC away from either side of carrier:

a. These spurious signals originate in the crystal. A few crystals will show some excitation near the fundamental mode of oscillation. Oscillator tuning may clear this condition in a few cases but usually the crystal must be replaced.

11. R.F. on Chassis or Mike:

a. Ineffective grounds or a very low impedance at the antenna termination to the transmitter may cause this - usually the former.

b. Read discussion on grounds in the pi network tuning discussion. Page 15.

c. R.F. pickup can result if an unshielded antenna lead-in is used with a high standing wave existing in the vicinity of the operator.

12. High 6146 "plt" current with Key up:

a. A fixed bias failure is indicated. Check 6AL5 tube.

b. Check bias voltage on second terminal from the rear of X21 (white wire).

c. Check the resistance of the bias supply terminal to ground. This should be in the neighborhood of 5000 ohms.

d. Check adjustment of R30 and R13.

13. A Squeal is heard on "phone":

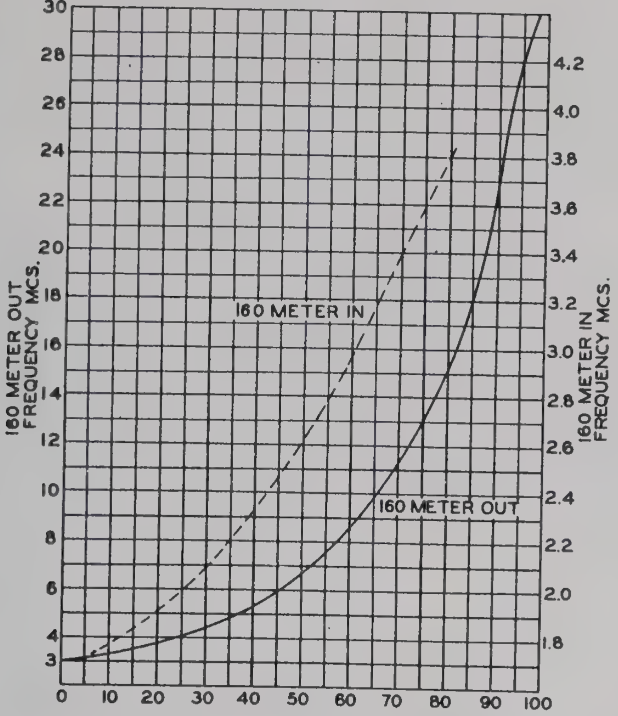
a. If squeal takes place with audio turned down, it is probable the 807 plate caps have been reversed.

b. If a squeal or howl takes place when the audio is turned up, acoustical feedback between the mike and receiver may be the cause.

c. A microphonic 6AU6 in the speech amplifier can originate a ringing or squealing noise.

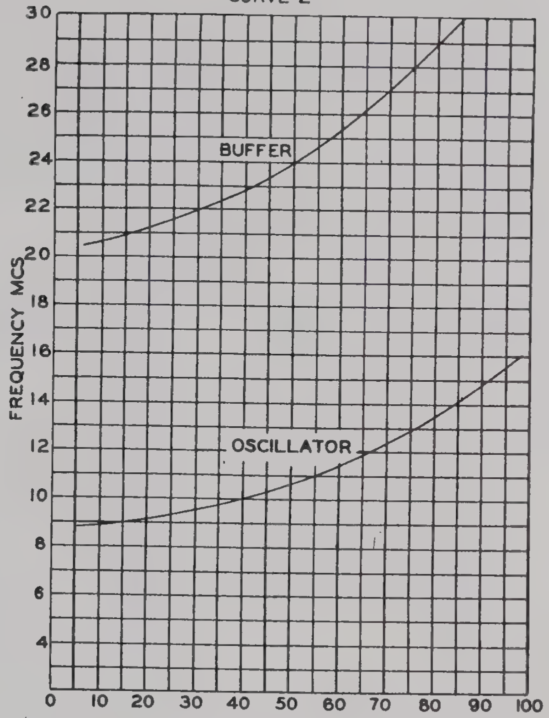
d. A poorly shielded mike connection or lead can cause feedback conditions.

CURVE 1



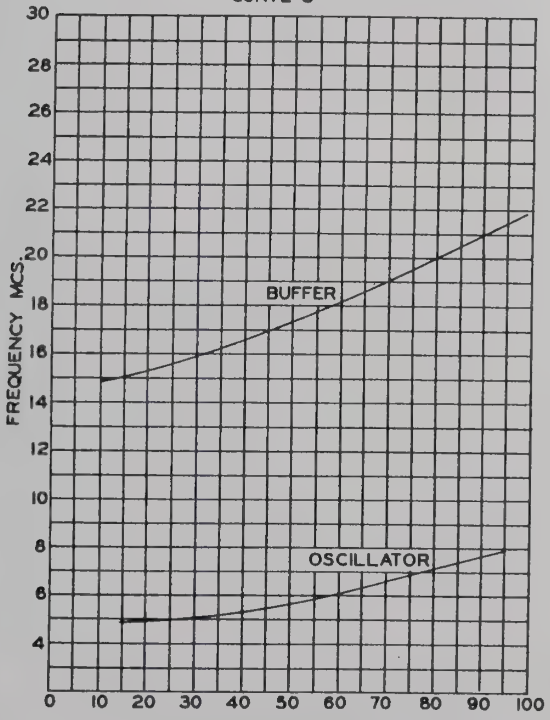
FINAL DIAL SETTING
FINAL AMPLIFIER TUNING CALIBRATION
VIKING II TRANSMITTER
LOADED TO FULL OUTPUT INTO 50 OHMS RESISTANCE

CURVE 2



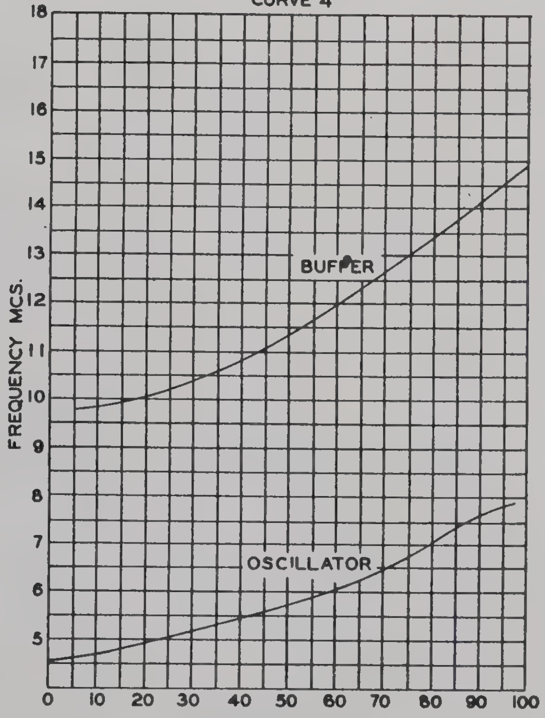
DIAL SETTINGS
EXCITER CALIBRATION 10 METER BANDSWITCH POSITION
VIKING II TRANSMITTER

CURVE 3



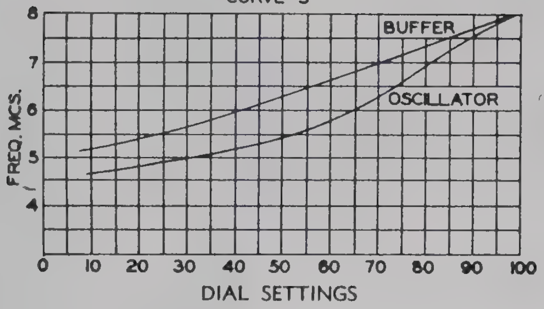
DIAL SETTINGS
EXCITER CALIBRATION 15 METER POSITION

CURVE 4



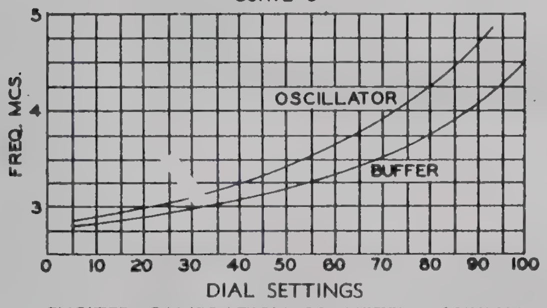
DIAL SETTINGS
EXCITER CALIBRATION 20 METER POSITION

CURVE 5



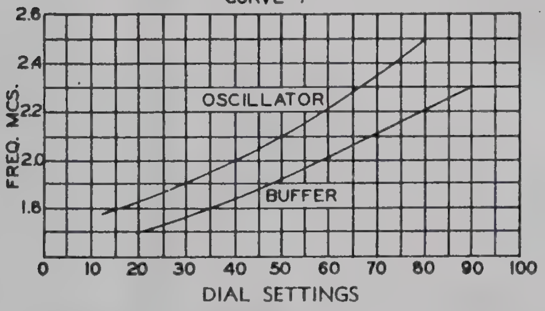
EXCITER CALIBRATION 40 METER POSITION

CURVE 6



EXCITER CALIBRATION 80 METER POSITION

CURVE 7



EXCITER CALIBRATION 160 METER POSITION

TABULATED DATA

Typical conditions, amplifier fully loaded into 50 ohms resistance

Curve No. 1

Freq.	Final Tuning Setting	Coarse Coupling	Fine Coupling	Remarks
30 MC	98.5	7	55	160 Meter Out
28	95	7	55	"
21	88	7	48	"
14	77	6	45	"
7	51.5	4	98	"
3.839	20	2	74	"
3.610	15	2	70	"
3 610	79	7	100	160 Meter In*
1.994	23	4	38	"
1.805	11	3	50	"

*Not fully loaded

Curve No. 2

MO or XTAL Freq. MC	Oscillator Setting	Buffer Setting	Buffer Output Freq.	P. A. Grid M. A. MC	Minimum M. O. Voltage Required For P. A. Grid M. A.
15 MO	92	86	30	6 ma.	0.8 V
14	85	75	28		0.95
					0.95
					1.95
12.8	77	62	25.6		6.4
10.8	51	20	21.2		1.4
9.34	23				
9.07	17				
7.00 XTAL	85	75	28		
7.00 MO	85	75	28		5.6

Curve No. 3

7.6 MC	88	100+	22.8	6 ma.	
7.0	79	85	21.0		XTAL
7.0	79	85	21.0		2.2 V
6.0	58	58	18.0		7.0
5.0	25	25	15.0		XTAL

Curve No. 4

7.3	83	93	14.6	6 ma.	1.4 V
7.0	80	86	14.0		1.1 V
7.0	80	86	14.0		XTAL
6.0	60	61	12.0		1.4 V
5.0	26	16	10.0		XTAL
4.95	23	98	14.85		XTAL
4.80	16	4	9.60		XTAL

Curve No. 5

8.0	100	98	8	6 ma.	1.0 V
7.6	90	85	7.6		.92 V
6.0	67	42	6.0		.45 V
5.0	34	0	5.0		XTAL

NOTE: The use of 80 meter crystals and doubling in the oscillator stage is satisfactory for 40 meter operation.

Curve No. 6

4.53	85	100	4.53	6 ma.	XTAL
4 00	72	87	4.00		XTAL
3.5	52	66	3.50		.2 V
3.0	22	34	3.00		.25 V
2.8	5	11	2.80		.7 V

Curve No. 7

2.4	73	97	2.4	6 ma.	.3 V
2.3	65	87	2.3		.3 V
2.0	38	57	2.0		.35 V
1.9	30	50	1.9		.35 V
1.8	15	34	1.8		.45 V

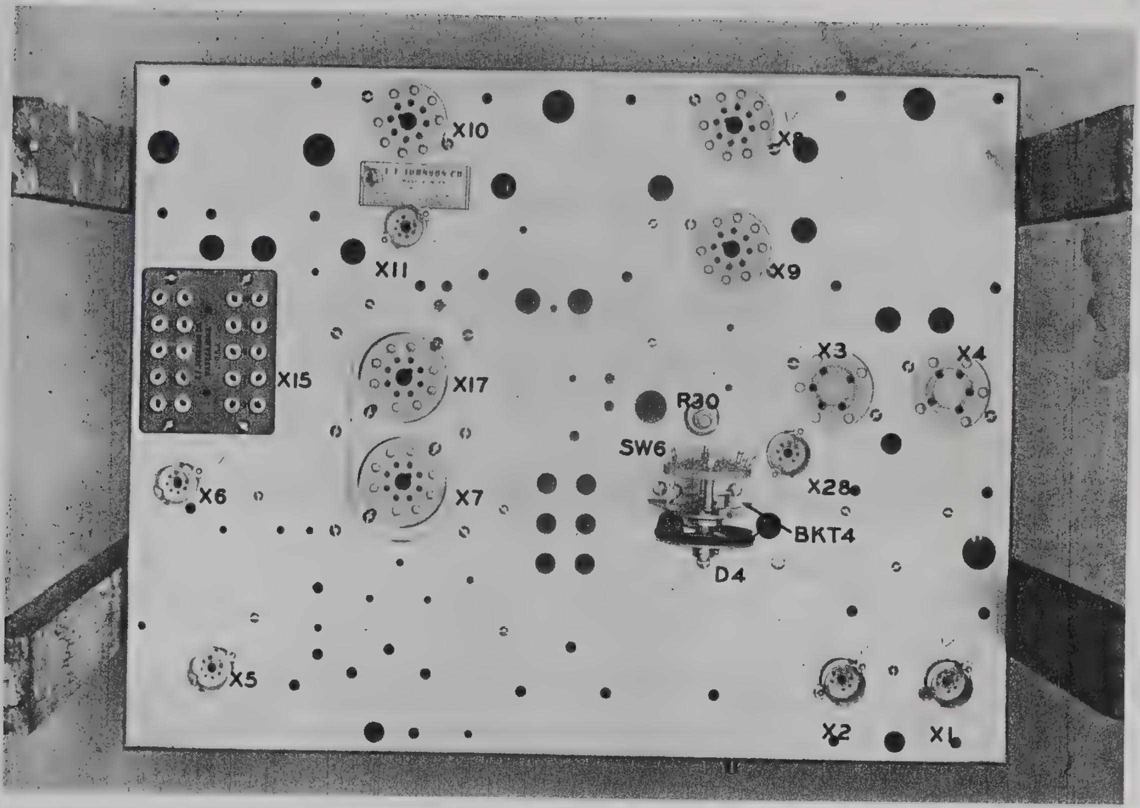


Figure 1—Socket Mounting

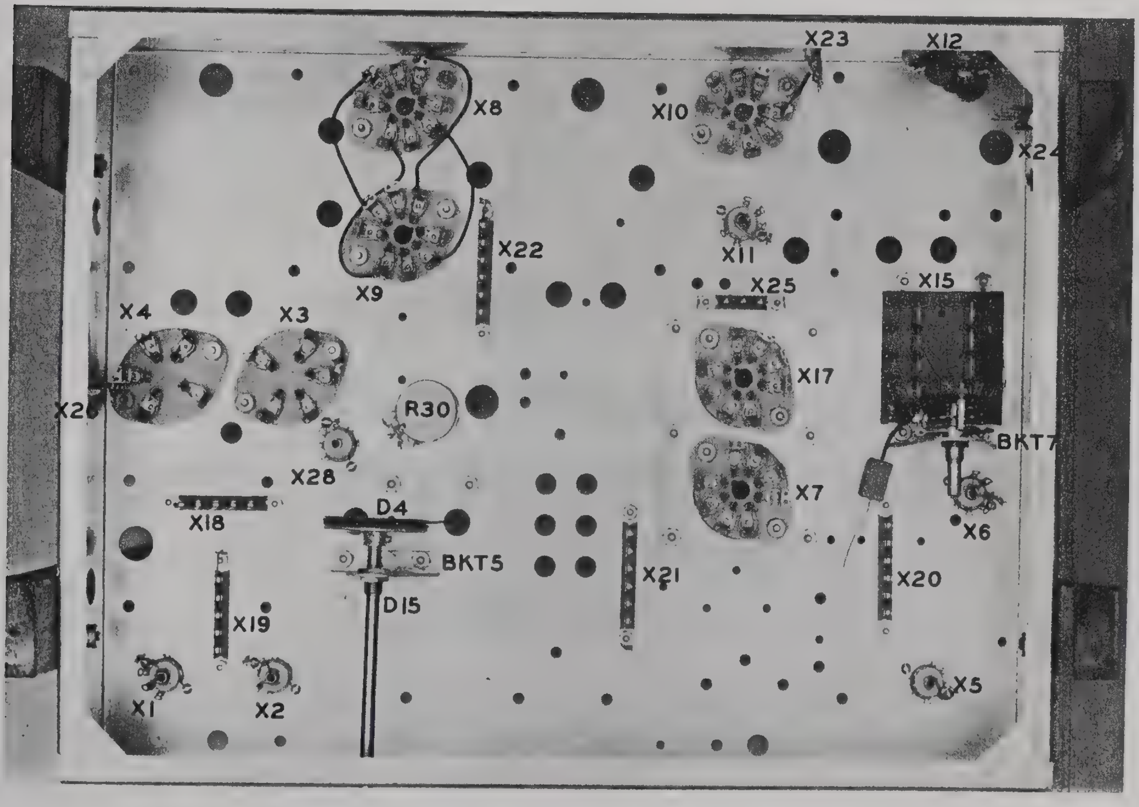


Figure 2—Socket and Terminal Board Mounting

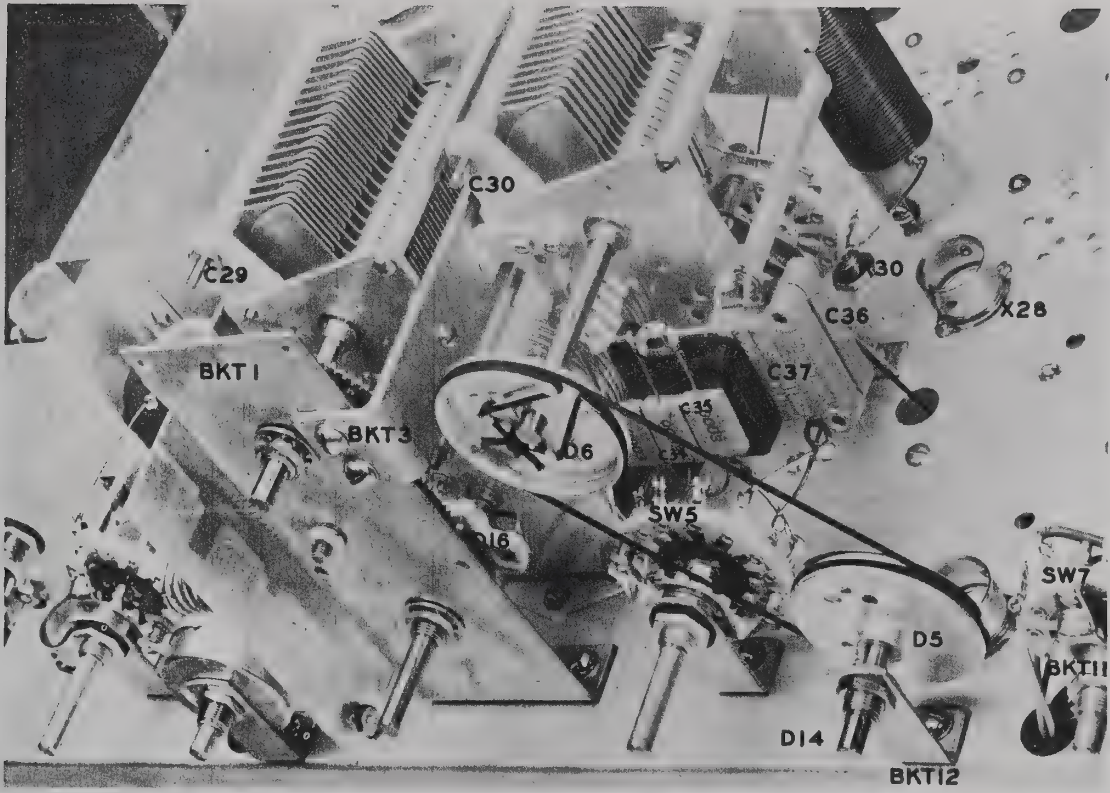


Figure 3—PA Assembly Detail

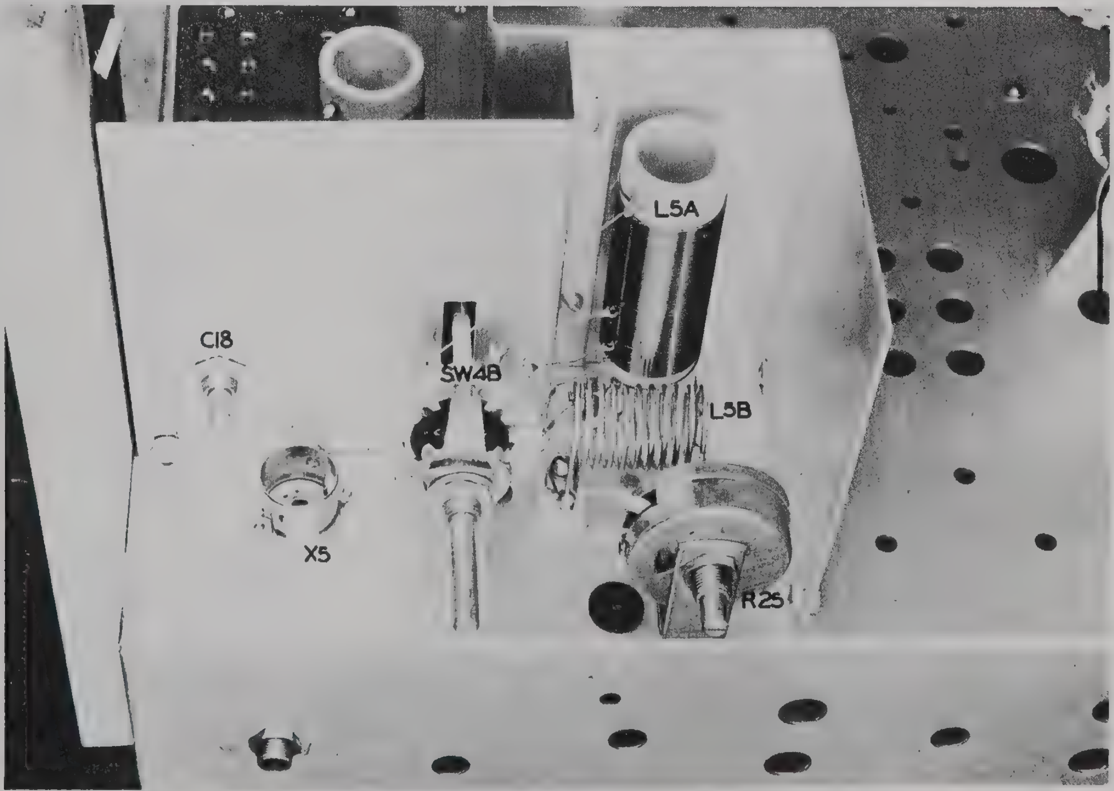


Figure 4—Buffer Assembly Detail

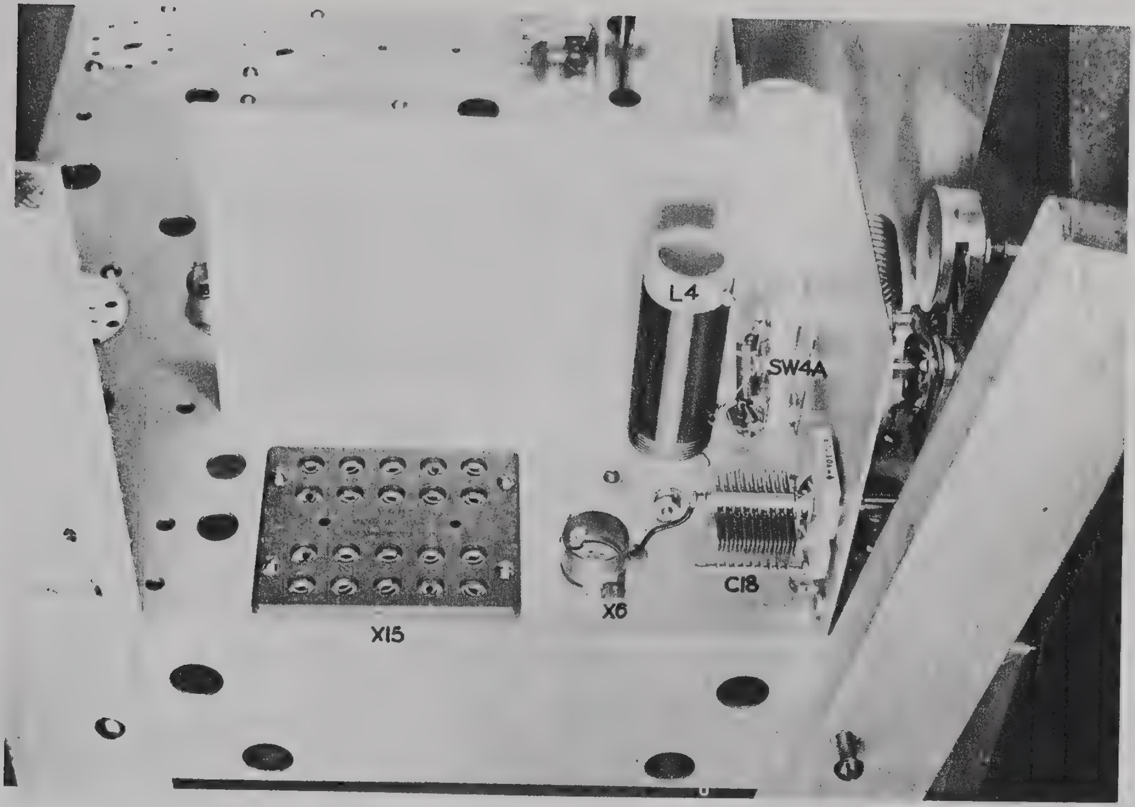


Figure 5—Oscillator Assembly Detail

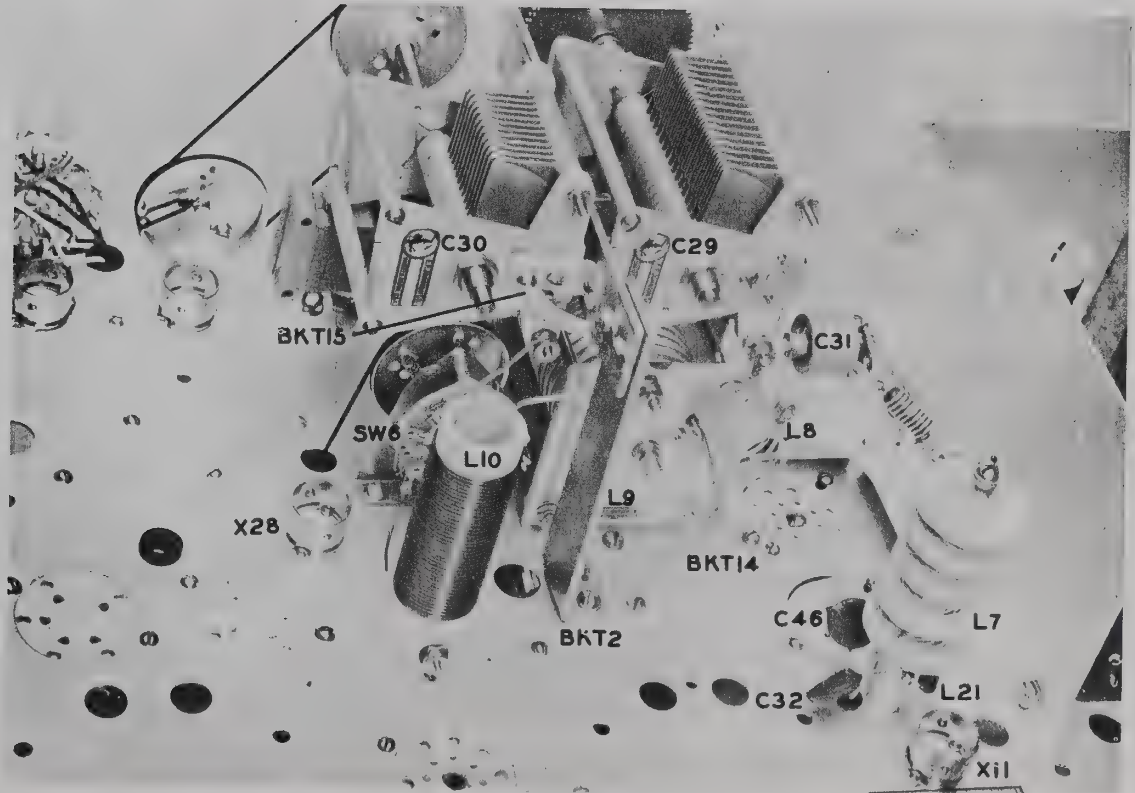


Figure 6-7—PA Assembly Detail

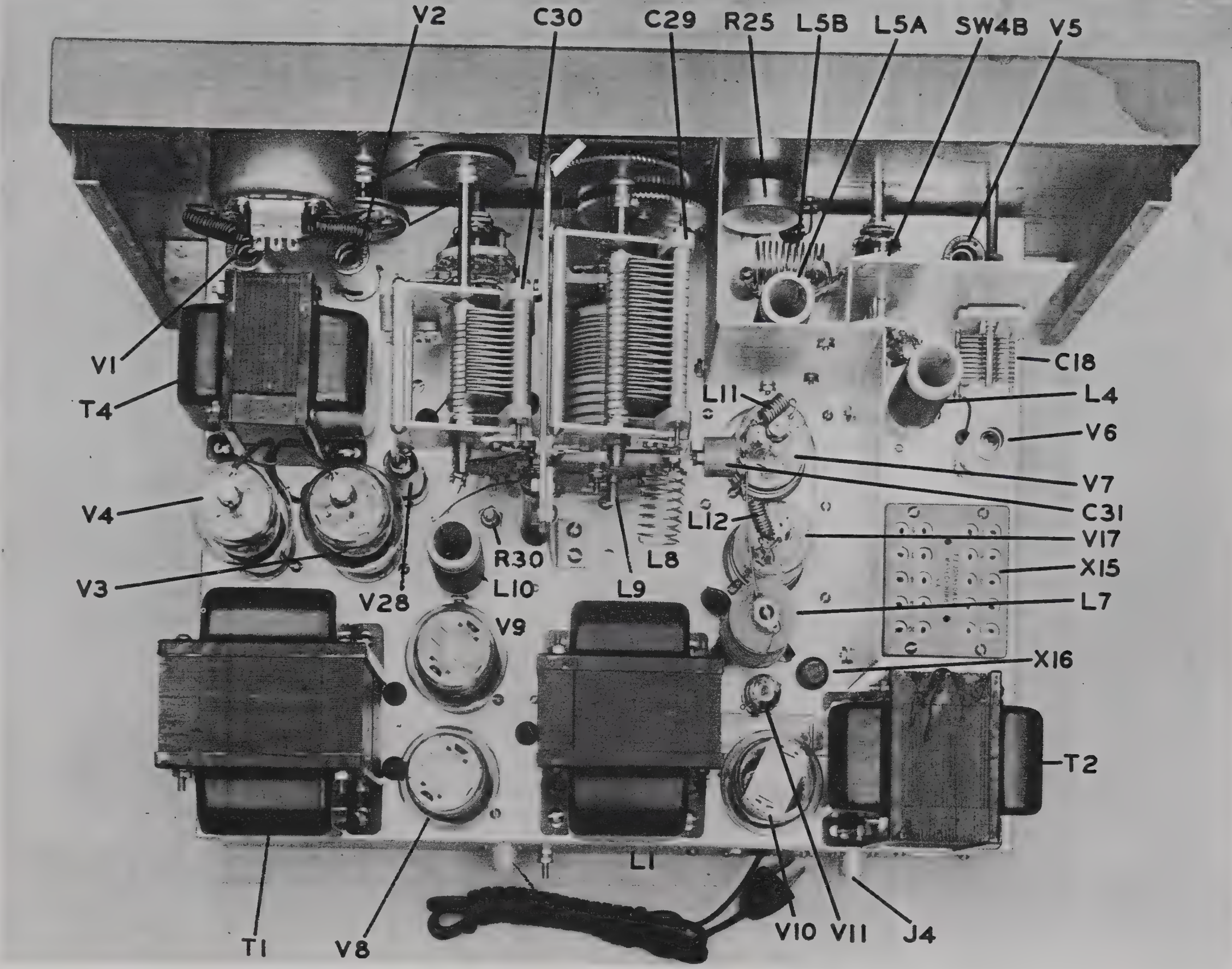


Figure 9—Completed Chassis

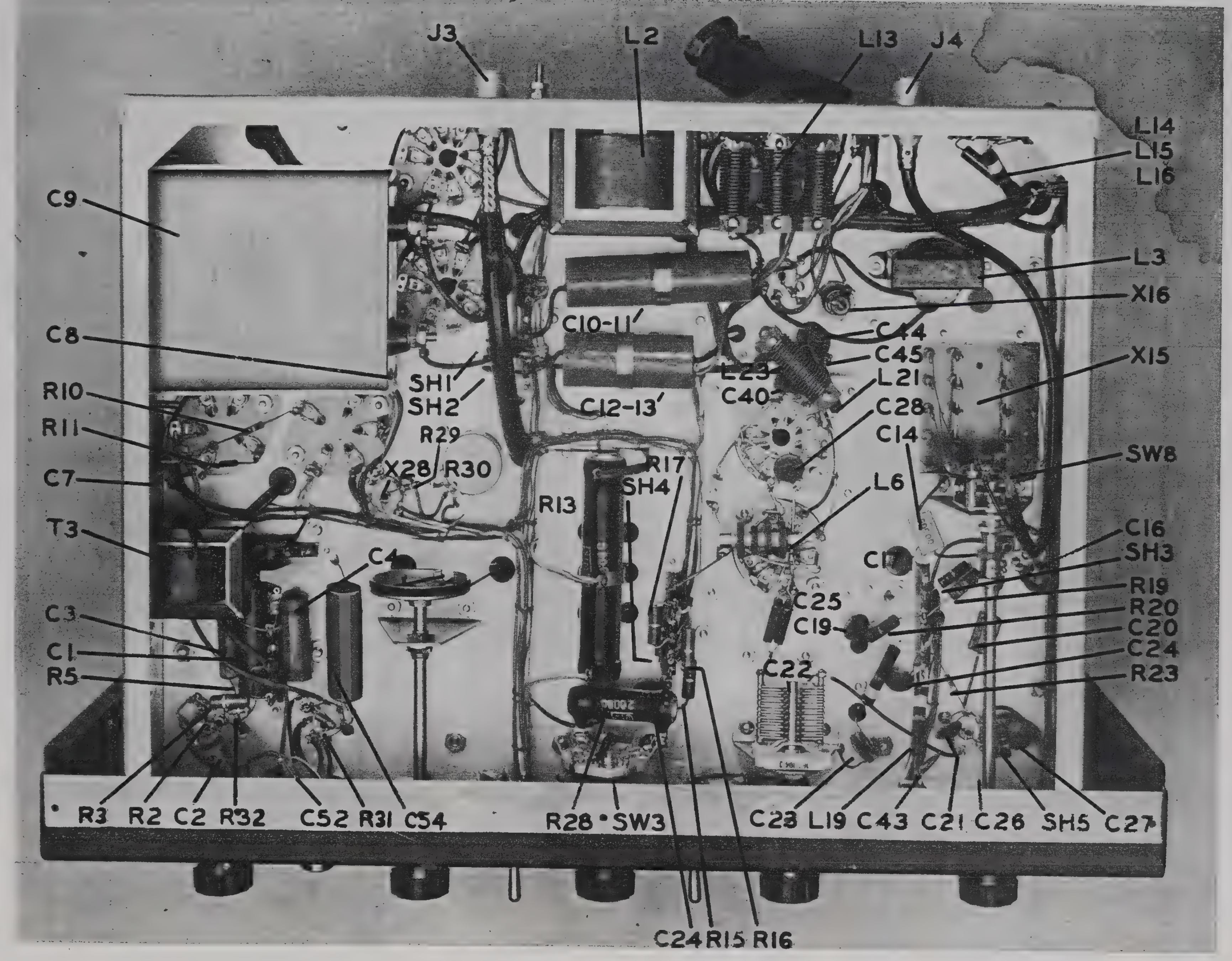


Figure 10—Completed Chassis

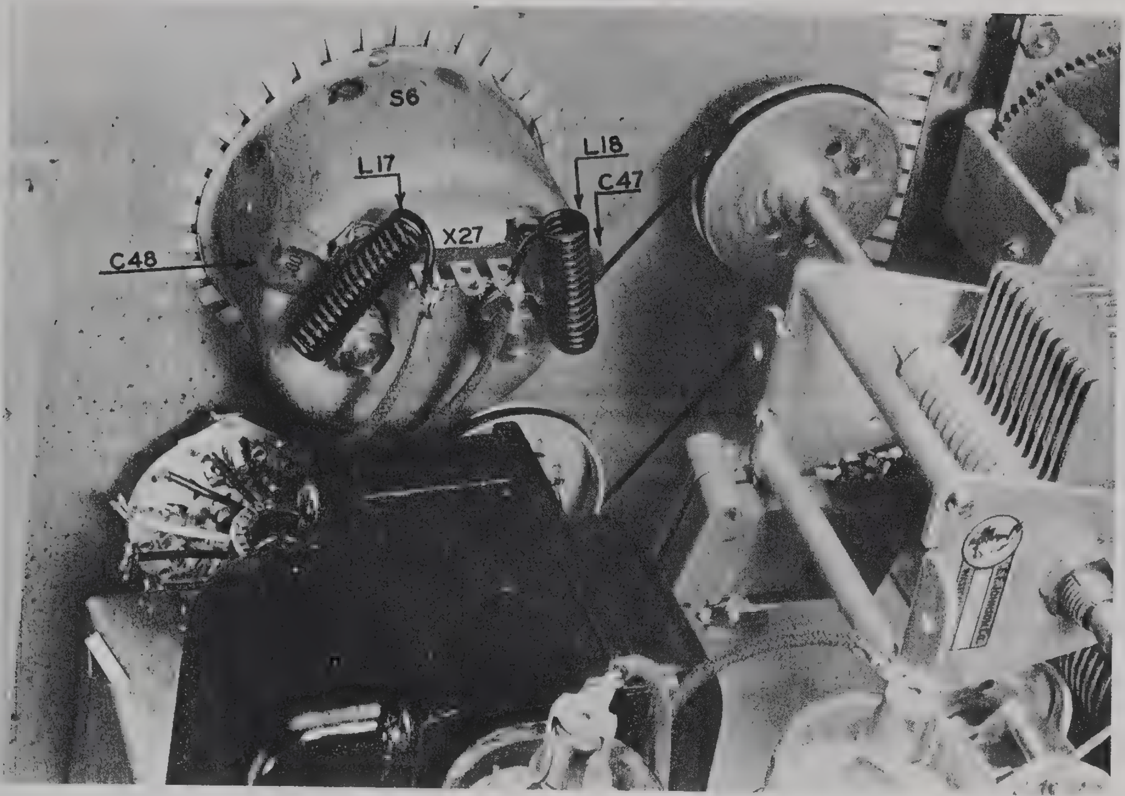


Figure 10a—Meter Filter Detail

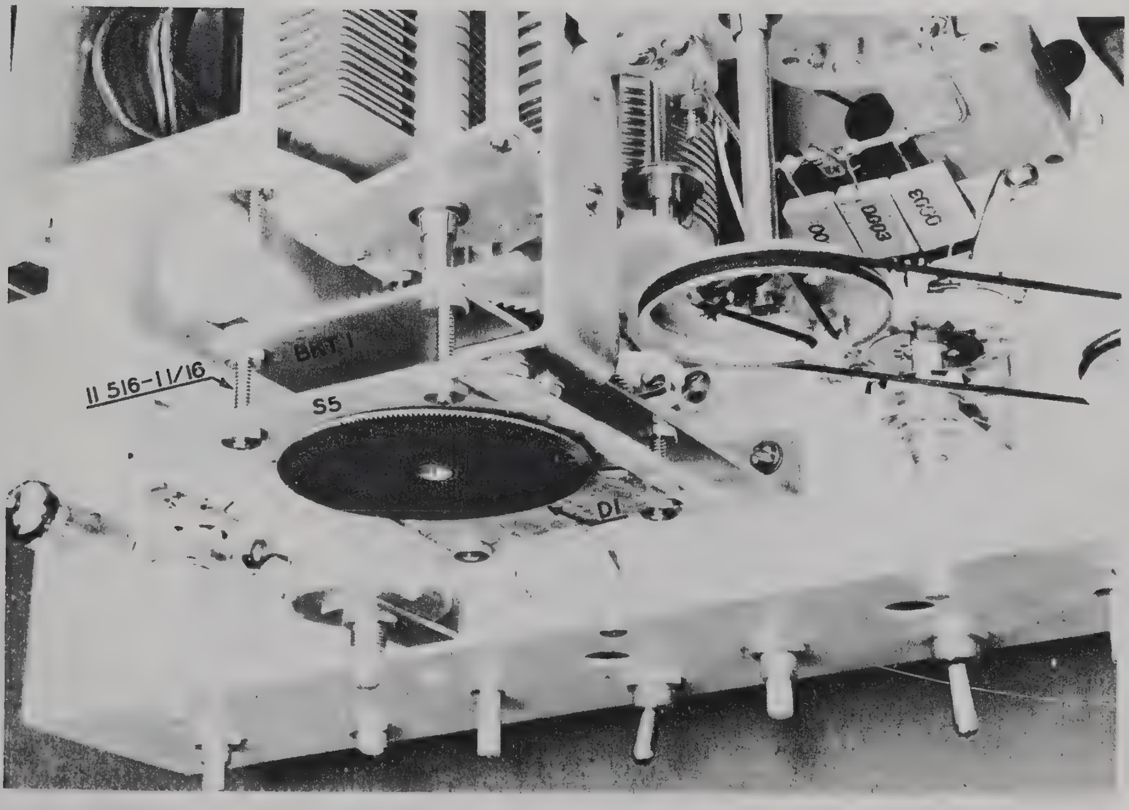


Figure 10b—Dial Window Shield Detail

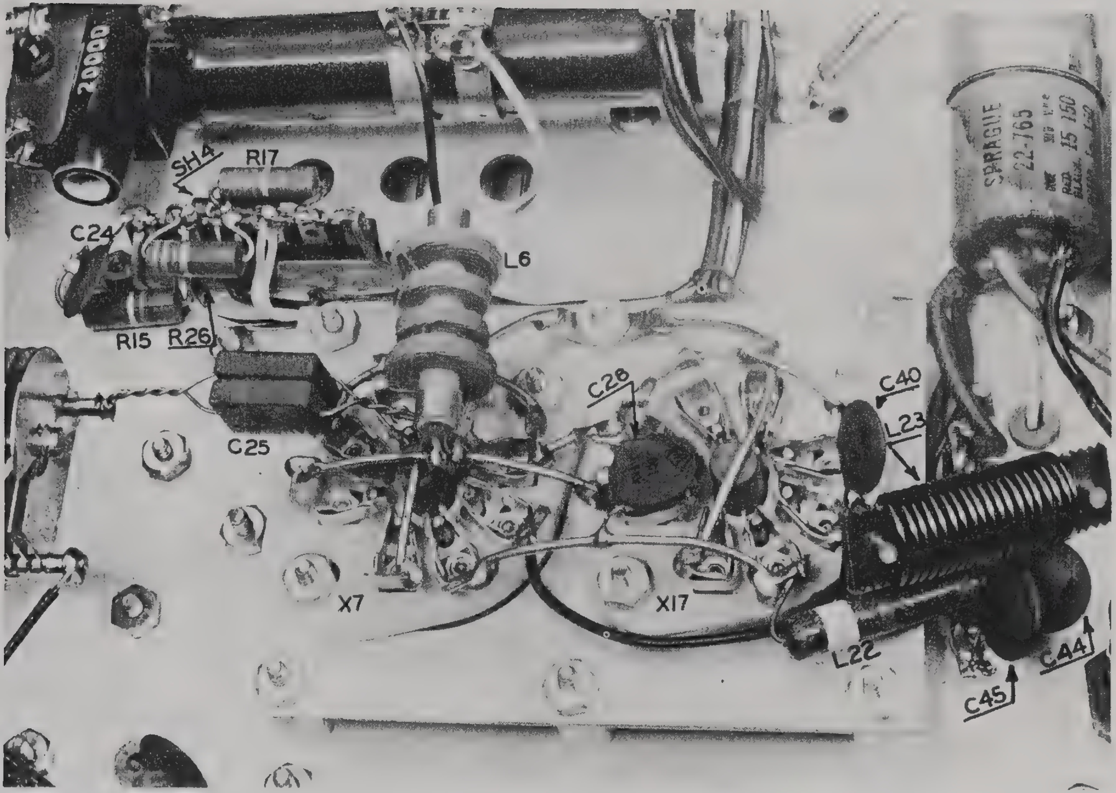


Figure 10c—6146 Socket Wiring

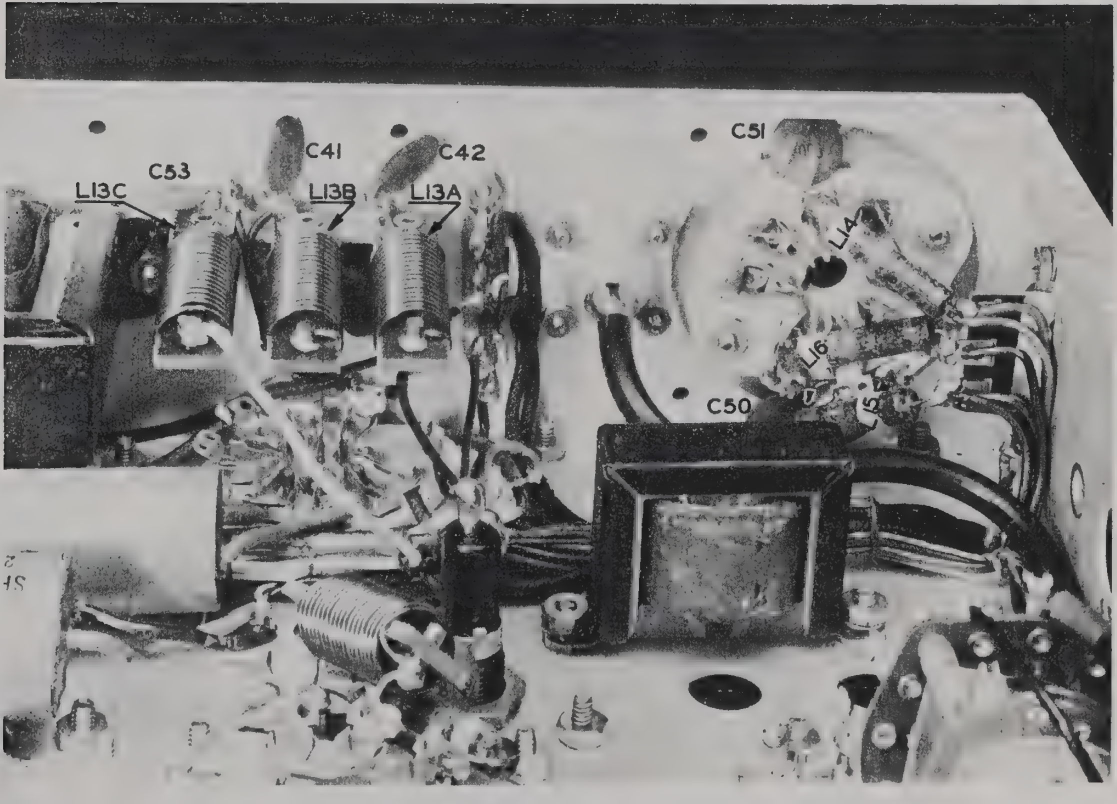
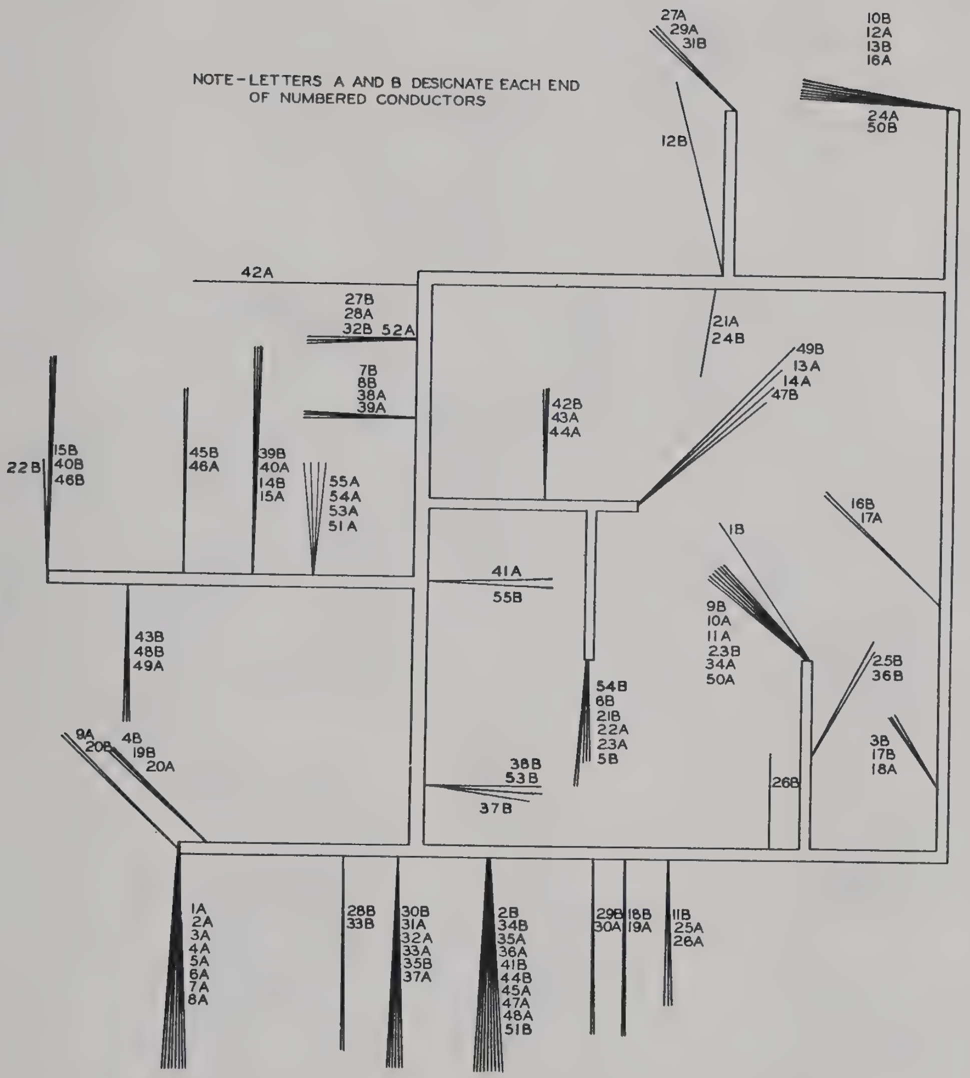


Figure 10d—Line Filter, VFO Socket Wiring Detail


NOTE-LETTERS A AND B DESIGNATE EACH END OF NUMBERED CONDUCTORS

LEAD COLORS	
1	BLUE
2	BROWN
3	GREY
4	BLACK
5	ORANGE
6	WHITE
7	YELLOW
8	VIOLET
9	RED
10	RED
11	RED
12	RED
13	GREEN
14	GREEN
15	GREEN
16	GREEN
17	GREEN
18	GREEN
19	GREEN
20	GREEN
21	WHITE
22	BLACK
23	BLACK-BROWN
24	GREEN
25	WHITE
26	BLACK
27	BLACK-BROWN
28	BLACK-BROWN
29	WHITE
30	BLUE-ORANGE
31	BLUE-ORANGE
32	GREY-RED
33	GREY-RED
34	BROWN
35	ORANGE
36	BLUE
37	BLACK
38	YELLOW
39	VIOLET
40	VIOLET
41	GRAY-RED
42	VIOLET
43	VIOLET
44	VIOLET
45	YELLOW-BLUE
46	YELLOW-BLUE
47	GREY
48	GREEN-WHITE
49	GREEN-WHITE
50	BROWN
51	RED
52	GREY-RED
53	YELLOW
54	BLUE
55	GREY-RED

Figure 11—Wiring Harness

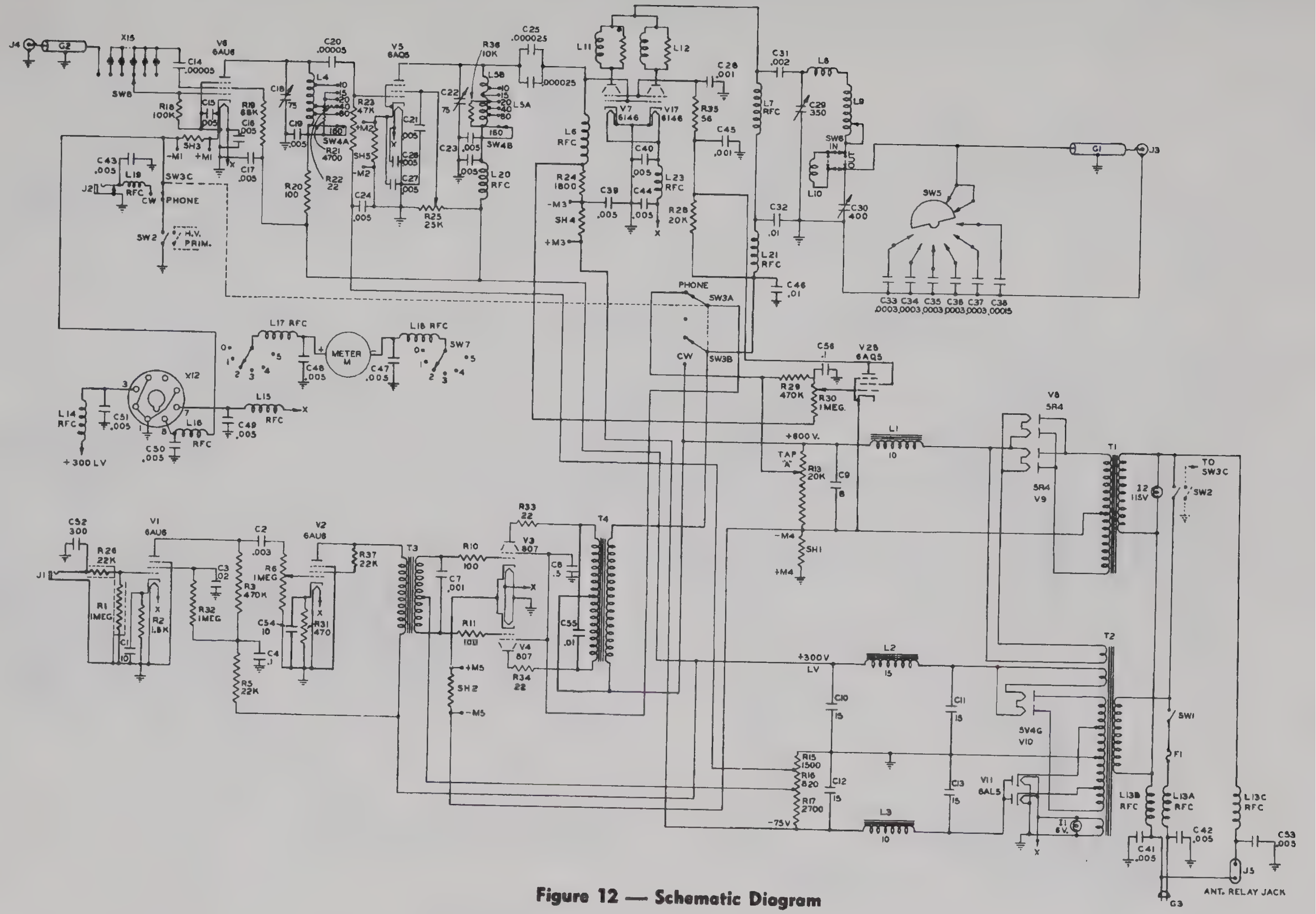


Figure 12 — Schematic Diagram

Late model

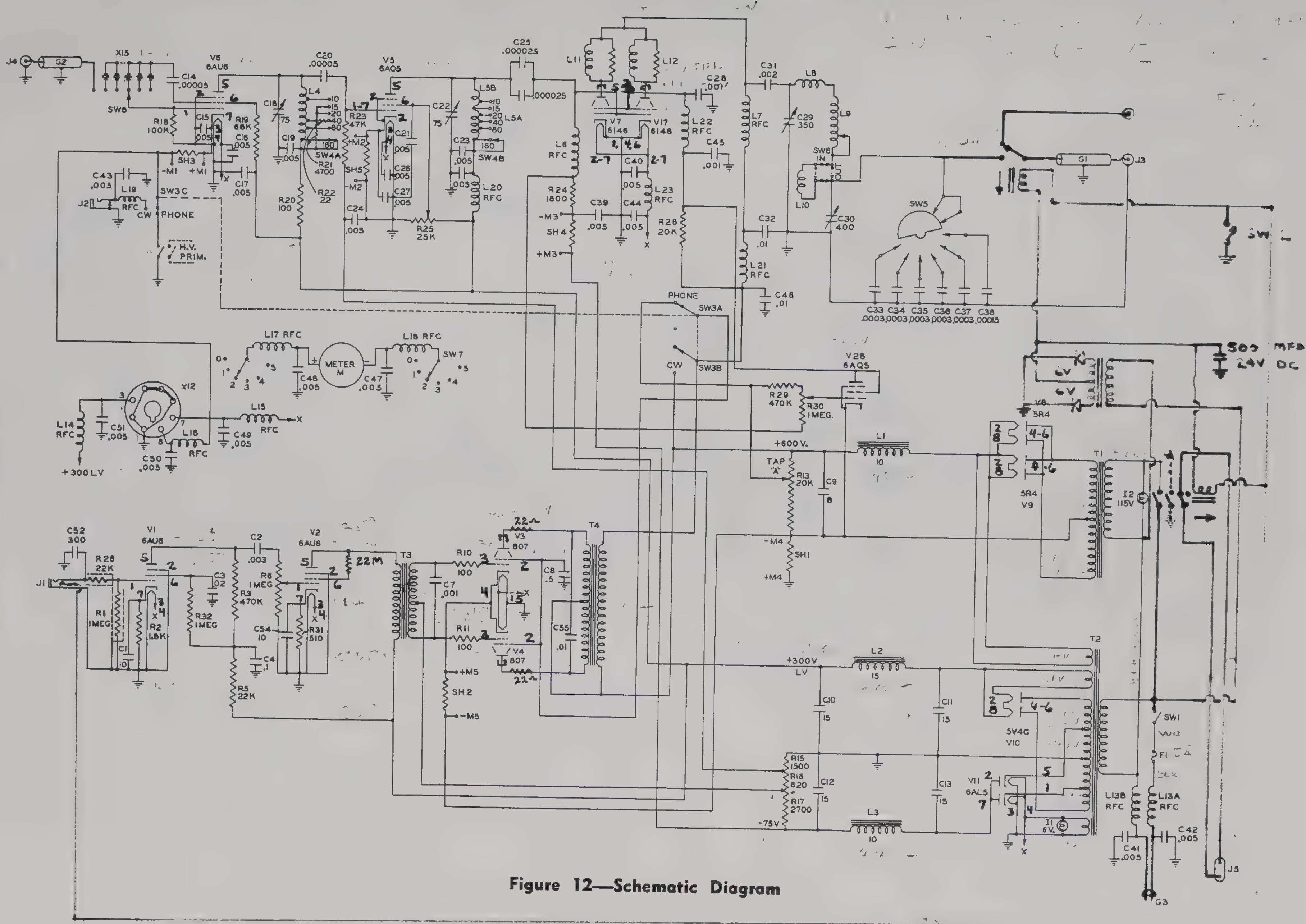
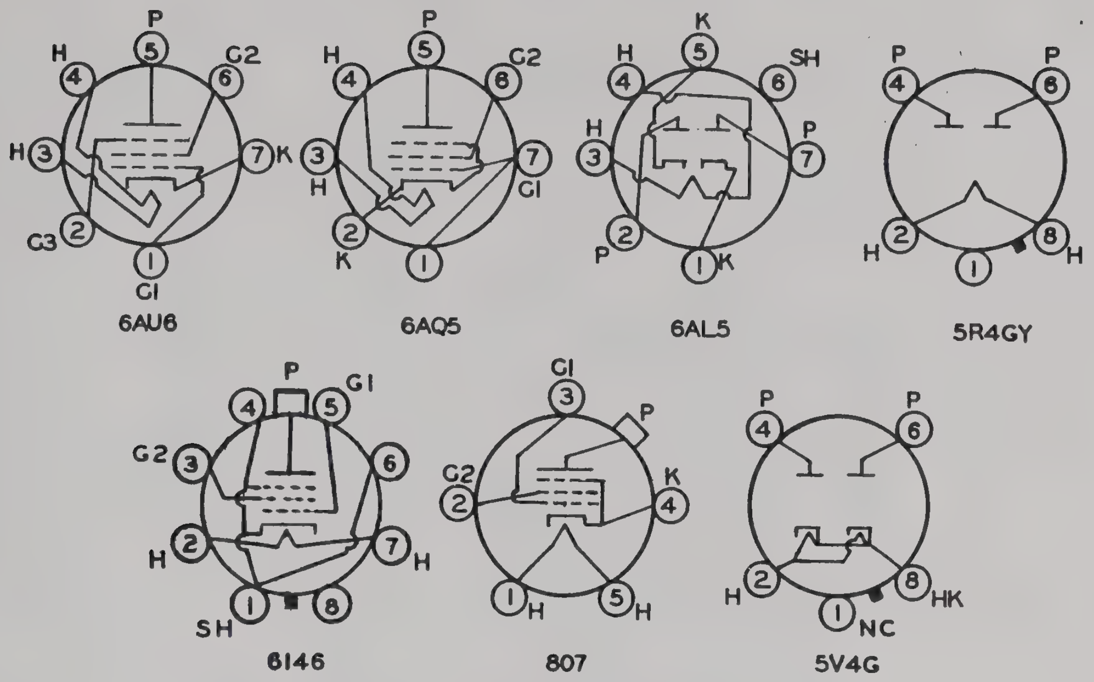


Figure 12—Schematic Diagram

TUBE SOCKET CONNECTIONS BOTTOM VIEW



6AU6 6AQ5 6AL5 5R4GY

6146 807 5V4G

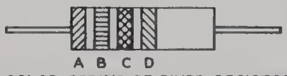
P PLATE
K CATHODE
H HEATER
SH SHIELD OR SHELL
G1 CONTROL GRID
G2 SCREEN GRID
G3 SUPPRESSOR GRID

Figure 13—Socket Connections

CONDENSER-RESISTOR COLOR CODE

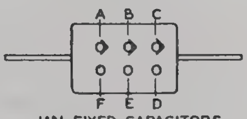
COLOR	SIGNIFICANT FIGURE	DECIMAL MULTIPLIER	TOLERANCE (%)	VOLTAGE RATING*
BLACK	0	1	—	—
BROWN	1	10	1*	100
RED	2	100	2*	200
ORANGE	3	1,000	3*	300
YELLOW	4	10,000	4*	400
GREEN	5	100,000	5*	500
BLUE	6	1,000,000	6*	600
VIOLET	7	10,000,000	7*	700
GRAY	8	100,000,000	8*	800
WHITE	9	1,000,000,000	9*	900
GOLD	-	0.1	5	1,000
SILVER	-	0.01	10	2,000
NO COLOR	-	—	20	500

* APPLIES TO CONDENSERS ONLY

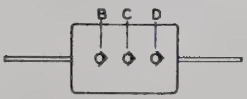


COLOR CODING OF FIXED RESISTORS

A-FIRST SIGNIFICANT FIGURE OF RESISTANCE IN OHMS
B-SECOND SIGNIFICANT FIGURE
C-DECIMAL MULTIPLIER
D-RESISTANCE TOLERANCE IN PERCENT. IF NO COLOR SHOWN TOLERANCE IS±20%.

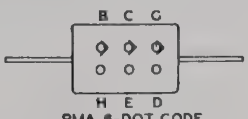


JAN FIXED CAPACITORS



RMA 3-DOT CODE 500VOLT± 20%.

COLOR CODING OF FIXED CONDENSERS
A-TYPE: MICA BLACK, PAPER SILVER
B-FIRST SIGNIFICANT FIGURE OF CAPACITY
C-SECOND SIGNIFICANT FIGURE
D-DECIMAL MULTIPLIER
E-TOLERANCE
F-CHARACTERISTIC
G-THIRD SIGNIFICANT FIGURE
H-VOLTAGE RATING



RMA 6-DOT CODE

Figure 14—Resistor, Capacitor Color Code

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Viking II Transmitter

Parts List

Part No. or Drawing No.	Item No.	Qty.	Description
197-127-2	CH 1	1	Cabinet
17.810	CH 2	1	Chassis
17.811	CH 3	1	Final tube mounting plate
23.900-2	BKT 1	1	Final Tuning Drive Assembly
17.754-2	BKT 3	1	Bracket - Final Cond. Mounting
17.752-1	BKT 2	1	Bracket - Final Tank Support
16.857-2	BKT 4-7	4	Bracket - Crystal Sel. and Mounting
16.1001-1	BKT 8-12	5	Bracket - Component Mounting
16.1044-2	BKT 13	2	Bracket - H.V. Filter Cond.
16.1089	BKT 14	1	Tank Grounding Strap
16.1088	BKT 15	1	Jumper Strap
23.906-2	D 1	1	0-100 Final Tuning Dial and Hub
23.908-1	D 2	1	Final Tuning Index and Escutcheon Plate Assembly
23.909	D 3-6	4	Drive Pulley Hub Assembly
42.49-150	D 7-8	8-1/2 ft.	Dial Cord
16.1027-1	D 9-10	2	Dial Cord Tension Springs 9/16 x 3/16 x .033 Wire
14.145-7	D 11	1	1/4" D. NPB Shaft Extension 5-1/2" long
14.145-6	D 13	1	1/4" D. NPB Shaft Extension 2-1/4" long
115-256-15	D 14	1	Shaft and Bearing Assembly 1-5/8" length
115-256-16	D 15	1	Shaft and Bearing Assembly 5-1/16" length
104-250-51	D 16	1	Insulated Coupling
13.123-7	D 17	2	Panel Bearing
104-258	D 18-19	2	Split Sleeve Coupling
23.910-2	K 1	1	Knob - Final Tuning
23.907-12	K 2-4	3	Knob Dial (100-0)
23.907-13	K 5-7	3	Knob Dial (10-0)
23.907-14	K 8-9	2	Knob Dial (Single Marker)
23.907-17	K 10	1	Knob Dial (Meter)
23.907-15	K 11	1	Knob Dial (7-1)
23.907-16	K 12	1	Knob Dial (Bandswitch)
		1	#4 Hardware Envelope
		1	#6 Hardware Envelope
		1	#8 Hardware Envelope
		1	#10 Hardware Envelope
		1	3/8" Hardware Envelope
		1	Terminal and Lug Hardware Envelope
29.387		1	15/32 I.D. x 59/64 O.D. Special Washer
13.49-9		6	Spacer 1/2" length x 3/8" O.D. Aluminum
23.08-2		1	Envelope Assembly for C30 Condenser
133-278-7	S1 S2 S5	3	1 3/4" Miniature Tube Shield
133-278-8	S6	1	2 1/4" Miniature Tube Shield

√

17.755	S4A	1	Oscillator Buffer Shield
17.756	S4B	1	Oscillator Buffer Shield
23.1003	S5	1	**Final Window Shield**
23.1004	S6	1	Meter Shield
17.814	S7	1	VFO Socket Shield
120-277B-1	X1 X2 X5 X6 X11 X28	5	Shielded 7 Pin Miniature Socket
122-225	X3 X4	2	5 Pin Wafer Socket
122-228	X8 X9 X10 X7 X17 X12	6	Octal Wafer Socket
147-620	X13A	1	115 V Candelabra Socket
147-600	X14A	1	6 V Miniature Socket
147-310-56	X13B	1	Faceted Jewel - red
147-310-57	X14B	1	Faceted Jewel - green
126-120	X15	1	Crystal Mounting Board
22.739-2	X16	1	Fuse Extractor Post
22.740-5	X18-19	2	"2005" Jones Terminal Strip
22.740-6	X20-22	3	"2006" Jones Terminal Strip
22.740-3	X23-27	5	"2003" Jones Terminal Strip
71.32-170	G1	1 ft.	RG8U Cable (cut to length)
71.32-178	G2	1¼ ft.	RG59U Cable (cut to length)
22.741	G3	1	Line cord and plug
22.113-1	G4-10	7	Rubber Grommet 9/16 OD
22.113-5	G11-15	5	Rubber Grommet 11/32 O.D.
22.742	F1	1	5 AMP 3AG Type or MTH Type 250 Volt Fuse
42.24-77	G16	8 in.	.034 ID Black extruded plastic tubing
42.24-107	G17	1 in.	.133 ID Black extruded plastic tubing
26.231	W1	1	Wiring Harness
71.91-100	W2	13½ ft.	Black Plastic Covered #20 Hookup wire
71.27-125	W3	7 ft.	#24 Tinned Copper Wire
71.27-110	W4	4 ft.	#14 Tinned Copper Wire
71.49-105	W5	1/2 ft.	#20 Stranded Shielded Wire
42.49-140	W6	6 ft.	#4 Waxed Lacing Cord
22.21	I1	1	#6S6 120 Volt candelabra Bulb
22.743	I2	1	#40 6-8 volt Min. Screw Bulb
119-852	TC 1-4	4	.360 Tube Cap
22.744	J1	1	Amphenol PC1M Mic. Connector
22.224	J2	1	Mallory A2A Ckt. Closing Jack
22.746	J 3-4	2	Amphenol 83-1R Receptacles
126-105	J5	1	Socket (Crystal Holder)
22.747	H1 H2	2	Amphenol 83-1H Hood
23.914-1	SH1 SH2	2	100 M.V. Shunt for 500 ma
22.711	SH3 SH4	2	100 M.V. Shunt for 25 ma
22.712	SH5	1	100 M.V. Shunt for 50 ma
22.748	L1	1	10 h 350 ma Filter Choke SNC #P1783
22.749	L2	1	15 h 95 ma Filter Choke SNC #P1501
22.750	L3	1	10 h 35 ma Filter Choke SNC #P1784
23.902-1	L4	1	Oscillator Coil
23.902-2	L5A	1	Buffer Coil
23.913	L5B	1	H.F. Buffer Coil
102-750	L6	1	750 R.F. Choke
102-754-2	L7	1	754 R.F. Choke

23.911	L8	1	Residual H.F. Final Coil
229-201	L9	1	Final Tuning Inductor
23.902-3	L10	1	160 Meter Aux. Coil
23.912	L11 L12	2	Parasitic Suppressor
23.1001	L13	1	Line Filter Choke VHF Choke Assembly
23.1000	L14-L22	7	VHF Filter Chokes
23.1002-1	L23	1	Filament VHF filter choke
22.751	T1	1	H.V. Plate Transformer SNC #1781
22.752	T2	1	L.V. and Fil. Transformer SNC #1893
22.753	T3	1	Audio Driver Transformer SNC #1503
22.754	T4	1	Modulation Transformer SNC #1992
22.755	SW1 ✓	1	SPST (6A-125V) Bat Handle Toggle Switch
22.756	SW2 ✓	1	DPDT (6A-125V) Bat Handle Toggle Switch
22.829	SW3	1	3 Pole 2 Pos. (CW-PH) Switch
22.758	SW4 ✓	1	2 Pole 6 Pos. (Band) Switch
22.759	SW5 ✓	1	1 Pole 7Pos. (Coupling) Switch
22.760	SW6	1	2 Pole 2 Pos. (160M) Switch
22.761	SW7 ✓	1	2 Pole 6 Pos. (Meter) Switch
22.628	SW8 ✓	1	1 Pole 11 Pos. (Crystal) Switch
167-104-3	C22	1	75L15 Variable Condenser
167-104-4	C18	1	75L15 Variable Condenser
154-2-3	C29	1	350E20 Variable Condenser
154-34-3	C30	1	400E15 Variable Condenser
22.763	C1	1	10 mfd 25 V.W. Electrolytic Condenser
22.764	C10 C11	1	Dual 15-15 mfd 450 V.W. Electrolytic Cond.
22.765	C12 C13	1	Dual 15-15 mfd 150 V.W. Electrolytic Cond.
22.835	C7	1	.001 mfd 400 V.W. Paper Condenser
22.766	C2	1	.003 mfd 400 V.W. Paper Condenser
22.767	C3 C6	2	.02 mfd 400 V.W. Paper Condenser
22.768	C4	1	.1 mfd 400 V.W. Paper Condenser
22.769	C8	1	.5 mfd 600 V.W. Paper Condenser
22.770	C5	1	.01 mfd 1000 V.W. Paper Condenser
22.771	C9	1	8 or 10 mfd 1000 V.W. Condenser
22.772	C36 C37	2	300 mmfd 600 V.W. Mica Condenser
22.773	C14	1	50 mmfd 500 V.W. Molded Mica Condenser
22.774	C33 C34 C35 C52	4	300 mmfd 500 V.W. Molded Mica Condenser
22.827	C15-17 C19 C21 C23 (2) C24 C26-27 C39-44 C47-51 C53	22	.005 mfd 600 V.W. Ceramic Disc Condenser
22.776	C20	1	50 mmfd 500 V.W. Silver Mica Condenser
22.777	C25	2	25 mmfd 500 V.W. Silver Mica Condenser
22.778	C38	1	150 mmfd 1200 V.W. Mica Condenser
22.828	C28 C45	2	.001 mfd 1500 V.W. Ceramic Disc Cond.
22.836	C31	1	.002 mfd 1500 V.W. Ceramic Transmitting Type Condenser
22.826	C32 C46	2	.01 mfd 1500 V.W. Ceramic Disc Cond.
22.719	R1	1	1 megohm - 1/2 Watt Carbon or Composition Resistor
22.715	R24 R2	2	1800 ohm - 1/2 Watt Carbon or Composition Resistor

22.718	R3	1	.47 megohm - 1/2 watt Carbon or Composition Resistor
22.716	R5 R26	2	22,000 ohm - 1/2 Watt Resistor
22.714	R7	1	220 ohm - 1/2 Watt Resistor
22.830	R10 R11	2	100 ohm - 1/2 Watt Resistor
22.574	R18	1	.1 Megohm - 1/2 Watt Resistor
22.713	R22	1	22 ohm - 1/2 Watt Carbon Resistor
22.717	R23	1	47,000 ohm - 1/2 Watt Resistor
22.728	R4 R9	2	.22 Megohm - 1 Watt Resistor
22.726	R8	1	47,000 - 1 Watt Resistor
22.722	R15	1	1500 ohm - 1 Watt Resistor
22.721	R16	1	820 ohm - 1 Watt Resistor
22.724	R17	1	2700 ohm - 1 Watt Resistor
22.831	R19	1	33,000 ohm - 1 Watt Resistor
22.720	R20	1	100 ohm - 1 Watt Resistor
22.725	R21	1	4700 ohm - 1 Watt Resistor
22.832	R6	1	1.0 Megohm Linear Volume Control
22.732	R25	1	25,000 ohm W.W. Potentiometer
22.729-2	R13	1	20,000 ohm W.W. adjustable Resistor
22.833	R28	1	20,000 ohm W.W. Fixed Resistor
22.762	M1	1	5 ma meter 20 ohm scale
22.780	V1 V2 V6	3	6AU6 Tubes
22.783	V3 V4	2	807 Tubes
22.781	V5 V28	2	6AQ5 Tube
22.788	V7 V17	2	6146 Tubes
22.784	V8 V9	2	5R4GY Tubes
22.791	V10	1	5V4G Tube
22.786	V11	1	6AL5 Tube
22.718	R29	1	470K to 500K 1/2 Watt Resistor
22.832	R30	1	1 Megohm Potentiometer (slotted shaft)

REPRESENTATIVES:

Atlanta 5, Ga., James Millar Associates, 1036 Peachtree St., N. E., ELgin 0919

Boston 6, Mass., Paul R. Sturgeon, 25 Huntington Ave., COpley 7-2562

Chicago 31, Ill., Ellinger Sales Co., 6540 Northwest Highway, ROdney 3-1570

Columbus 15, Ohio, Wm. E. McFadden, 150 East Broad St., MAin 3363

Denver 3, Colo., Ronald G. Bowen, 825 Broadway, Rooms 307-309, AComa 5211

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Kansas City 8, Mo., Herbert A. Roes & Co., 2601 Cherry St., HArrison 2036

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Bendix Building, Richmond 7-0401

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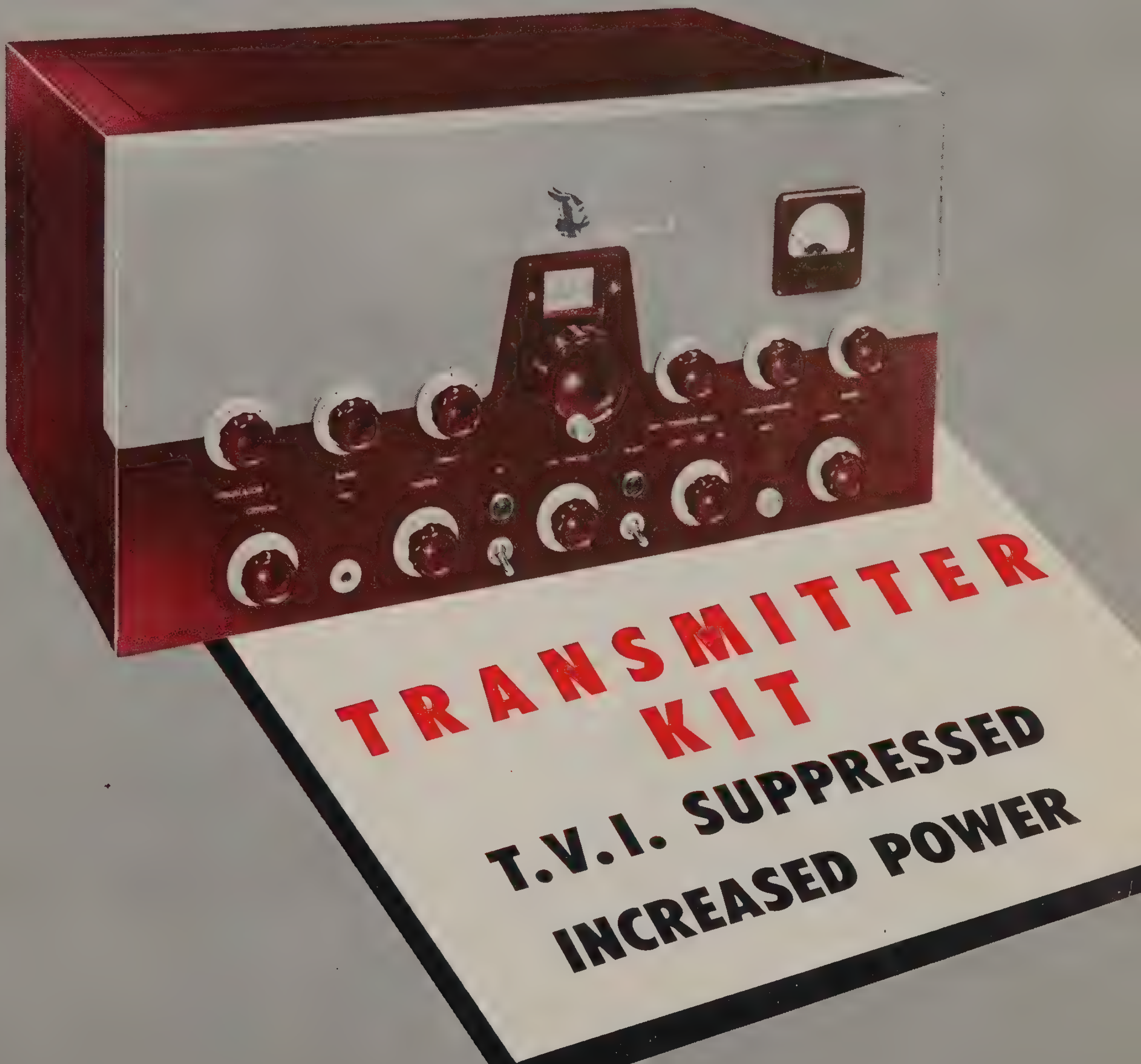
Johnson Viking II



TRANSMITTER KIT

T.V.I. SUPPRESSED
INCREASED POWER

E. F. JOHNSON COMPANY · WASECA, MINNESOTA

Johnson

TRANSMITTE

FEATURES:

- Amplitude Modulation
- Instant Band Switching
- VFO Input Provision
- Dual Power Supplies
- Self Contained, No Plug-in Coils
- Pi-Network Coupling Output Amplifier

RATINGS:

- 100 Watts Phone Output
- 130 Watts CW Output
- 135 Watts Phone Input
- 180 Watts CW Input

TUBE LINE-UP:

- 6AU6 crystal oscillator
- 6AQ5 buffer/doubler
- Parallel 6146s final amplifier
- 6AU6 voltage amplifier
- 6AU6 driver
- 807 pp modulators
- 5R4GY HV rectifiers
- 5V4G LV rectifier
- 6AL5 bias rectifier

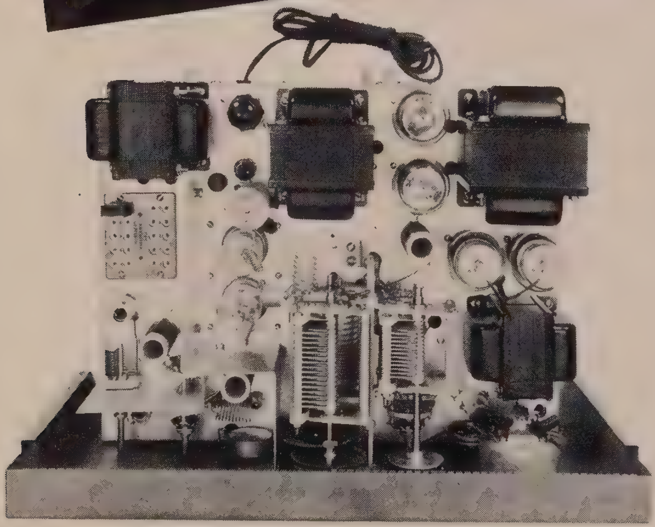


Figure 1. Chassis, Top View

HERE IT IS! The JOHNSON Viking II, successor to the Viking I, and the most versatile, most complete transmitter kit on the market. More than just a kit, the JOHNSON Viking II is an expertly designed and engineered transmitter, furnished unassembled but complete to the last detail.

Includes all necessary parts, hardware, tubes, wiring harness, cabinet and complete assembly instructions. The Viking II performs excellently on every amateur band from 10 to 160, including 15 meters. Output ratings of 100 watts phone, and 130 watts CW were established on the 10 meter band; efficiency on other bands is comparable. The Viking II provides full excitation to the final amplifier on all frequencies; the complete output range of the unit is listed below:

Band	Low Freq. Limit	High Freq. Limit	Band	Low Freq. Limit	High Freq. Limit
160	1.8 mcs.	2.4 mcs.	20	9.8 mcs.	15.0 mcs.
80	2.9 mcs.	4.4 mcs.	15	15.0 mcs.	21.8 mcs.
40	5.2 mcs.	8.0 mcs.	10	21.0 mcs.	30.0 mcs.

POWER SUPPLIES—The low voltage power supply furnishes 300 volts for exciter and speech amplifier plates. In addition to the 5V4G rectifier, a 6AL5 diode rectifying the tapped transformer secondary winding, furnishes well regulated fixed bias for the final amplifier, modulator, and the 6AQ5 buffer/doubler. The 600 volt supply with parallel 5R4GY rectifiers furnishes plate and screen voltage for the 6146s and 807 modulators. High vacuum rectifiers in both power supplies eliminate the need for hash suppression and time delay circuits. Line power consumption is approximately 375 watts when delivering full phone output, primary fusing protects the equipment from accidental overloads. Available for 115 volt 50/60 cycle ac operation only.

The output of the JOHNSON Viking II transmitter, for practical purposes, is uniform throughout its entire range, and the exciter design is such that a minimum number of crystals is required. The pi-section output stage enables the transmitter to be matched to unbalanced antennas with impedances from 50 to 600 ohms. Whether feeding antennas or antenna couplers, the pi-network can tune out several hundred ohms reactance as well. The final tank coil is a Steatite insulated,variable inductor with variable pitch winding maintaining high tank circuit Q throughout its range. The inductor and the band switching exciter entirely eliminate coil changing. Using a crystal microphone, sufficient audio gain and power are available for 100% modulation of the transmitter's maximum input.

RF SECTION—The rf section of the transmitter consists of a 6AU6 crystal oscillator driving a 6AQ5 buffer/doubler which in turn drives the parallel 6146's of the final amplifier. The oscillator utilizes a JOHNSON crystal selector assembly which permits the selection of any one of

Viking II

KIT

ten crystal frequencies from the front panel. An eleventh position on the crystal switch provides for use of an external VFO. The 6AQ5 buffer/doubler is "loafing" when driving the parallel 6146's to full output on all bands. A potentiometer in the screen of the 6AQ5 gives smooth front panel control of amplifier excitation. Parasitics have been effectively suppressed, amplifier neutralization is not required.

KEYING—Fixed bias voltages of the 6AQ5 buffer and the 6146 final amplifier are very near cut-off. Oscillator cathode keying may be used for either crystal controlled or VFO operation.

METERING—Transmitter metering is provided by a milliameter used as a millivoltmeter and switched across permanently connected shunts. Prevents accidental circuit opening due to meter switching.

AUDIO SYSTEM—100% amplitude plate and screen grid modulation of the 6146 RF amplifiers is achieved with pp class AB_1 807 modulators. The speech amplifier consists of a 6AU6 voltage amplifier and 6AU6 driver, designed for high impedance microphones. Frequency response is centered in the speech range for most effective voice communication. Degenerative feedback is used to smooth out the response curve and good audio quality is maintained through extremely simple modulator design. Full output of the audio system is also available at nominal 500 ohms impedance for driving a high powered modulator.

EXCITER—A unique crystal oscillator circuit is used in the Viking II. In this oscillator, a Pierce circuit uses the screen of the 6AU6 as a plate, and the oscillator output is electron coupled to the plate. The circuit is a good frequency multiplier, has low crystal current, and requires only a slight amount of excitation from a VFO.

The exciter design is extremely flexible even though only two tubes are used and the circuit is band-switching. On the 160, 80, and 40 meter bands the 6AQ5 is used as a buffer, as a doubler or tripler on 20, 15 and 10 meters. If crystals are used in the manner recommended and their frequencies properly chosen, there is almost no possibility of obtaining output from the exciter which falls outside the amateur band.

VFO REQUIREMENTS—When used with an external VFO the transmitter is easily driven. Less than six volts of 7.5 mc. RF is required for full output at 30 mcs., less for the 14 and 7 mc. bands. Two volts of 1.75 mc. VFO output is ample excitation for 1.75 and 3.5 mc. output.

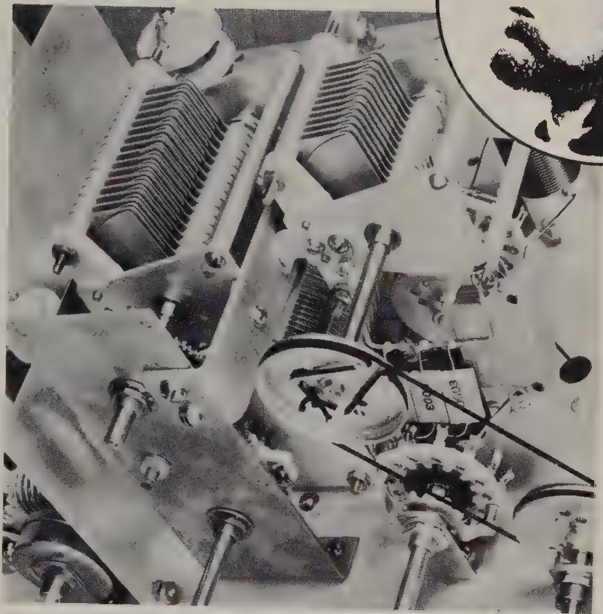


Figure 2. Pi-network Coupling System

An octal socket on the rear of the chassis provides 6.3 volts ac at 0.6 amperes for VFO filaments and 30 milliamperes at 300 volts dc unregulated for VFO plate voltage. The 240-122 Viking VFO may be keyed from the transmitter, and simply plugs into the chassis for instant operation.

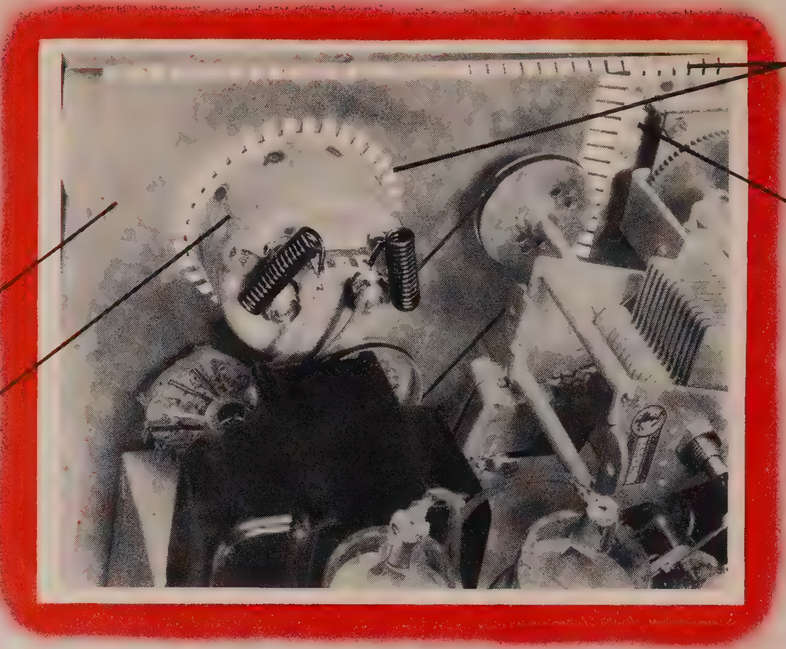
The variable inductor tuning of the amplifier saves space without appreciable loss of efficiency. Separate coils, sufficiently large to handle the amplifier circulating current, would consume a prohibitive amount of cabinet space. Plug in coils would compromise the transmitter's flexible design. The final tank tuning condenser is ganged to the variable inductor and maintains a nearly constant L/C ratio across the entire tuning range.

In order to cover the 160 meter band, additional series inductance is switched into the circuit. The output coupling capacitor consists of a 400 mmf. variable and additional fixed capacitors which can be switched in parallel to match low impedance loads to the amplifier. Maximum value of the coupling capacitor is 2,050 mmf.

Xtal Freq.	Output Band						
	160	80	40	20	15	10	11
1.8-2.0 mc	√	√	√				
3.5-4.0 mc		√	√	√	√		
7.0-7.3 mc			√	√	√	√	
14-14.4 mc				√			
6.7-6.85 mc							√

The chart above indicates the crystals which may be used for full output on the amateur bands covered by the transmitter.

TVI Supression Features



Silver Plated, Phosphor Bronze Bonding Fingers

Copper Plated Dial Window Shield

Copper Plated Steel Cabinet

Copper Plated Meter Shield

Filters, located at: Powerline, Keying Jack, Micro-Phone Connector, Antenna Relay Connector, and VFO Power Socket.

Figure 3. TVI Suppression Features

TVI SUPPRESSION MEASURES—The Viking II is completely enclosed in a steel cabinet, heavily copper plated. Top and bottom are perforated to permit free circulation of cooling air. The lid, easily removed as shown in **Figure 4.** is bonded with silver plated, phosphor bronze contact fingers. Special shields for meter, dial window, and VFO power receptacle maintain effective TV shielding.

Filters, consisting of low inductance chokes and ceramic disc capacitors, are located at the: power line, keying jack, microphone connector and VFO power socket. The antenna relay connector, energized by the "plate" switch is likewise filtered. Additional filters are used to suppress spurious output frequencies at their source. Coaxial output and VFO input connectors keep shielding intact.

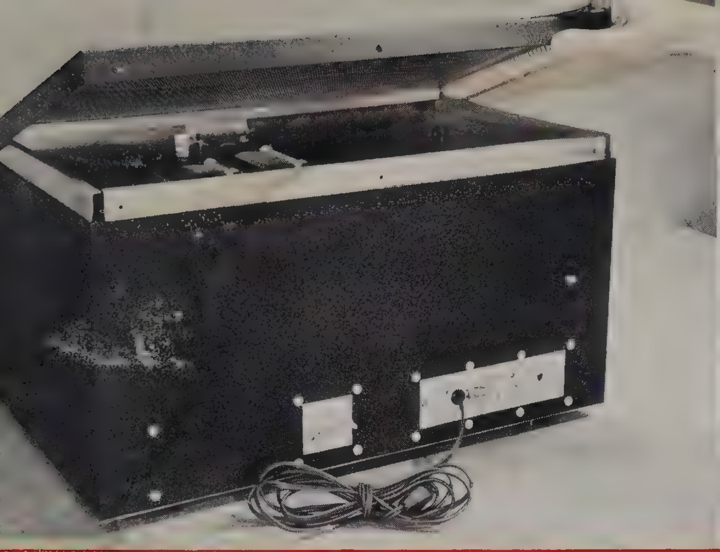
ANTENNAS AND LOADING—The pi-section tank circuit of the Viking II can be loaded into random length single wire antennas, permitting operation on several bands without any change in the antenna system.

In areas with television service, it may prove necessary to use a low pass filter, to avoid television interference. If so, then the load must be a "flat" coaxial line, the impedance of which is equal to the characteristic impedance of the filter. The pi-network tank circuit is capable of perfectly matching the impedance of any commonly used low pass filter at any amateur frequency throughout the range 1.8 - 29.7 mcs. The JOHNSON 250-20 Low Pass Filter is available as a separate accessory and when used can provide an additional 75 db harmonic attenuation.

For novice operation, the final amplifier input may be reduced to 75 watts by means of the front panel "coupling" controls and adjustment of the screen voltage. Modification of the transmitter is not required.

ASSEMBLY—The Viking II was designed as a kit and can be assembled by a novice as well as the experienced amateur. Instructions include photographs of each stage of assembly, schematic diagram, wiring harness diagram, tube socket connections, codes used to mark components, test methods and data. No outside source of information is required. Thus the appearance and performance of the completed Viking II will be equal to that of our laboratory models.

The chassis, panel, and cabinet are formed and punched at the factory. No drilling or other metal work is required. Complete to the last detail, the parts kit includes brackets, dial, cord, solder, terminals, washers, spacers, wire, grommets and all other small hardware items. A wiring harness containing all ac and dc power leads is furnished, reducing the possibility of incorrect wiring and giving the appearance of a factory assembled unit.



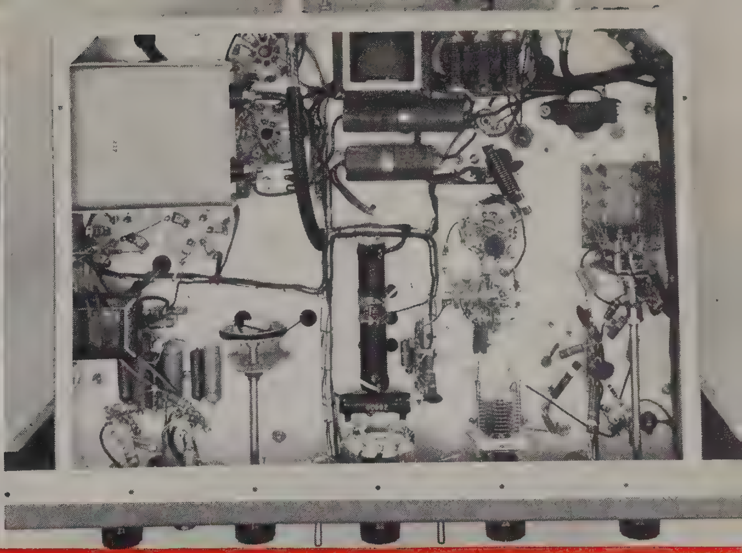


Figure 4. Lid Removal, Showing Phosphor Bronze Bonding Fingers

Figure 5. Chassis, Bottom View

APPEARANCE—Microphone input connector, keying jack and all controls are conveniently located on the front panel. The antenna relay connector, VFO input, and power receptacles are located on the rear of the chassis. The transmitter is housed in dark maroon wrinkle finished desk cabinet, 10⅞" x 13-3/16" x 20", weight when assembled is approximately 65 pounds. Front panel has a matching gray and maroon two tone finish. The skirted knobs furnished with the kit were designed especially for the Viking and accent its finished, commercial appearance.

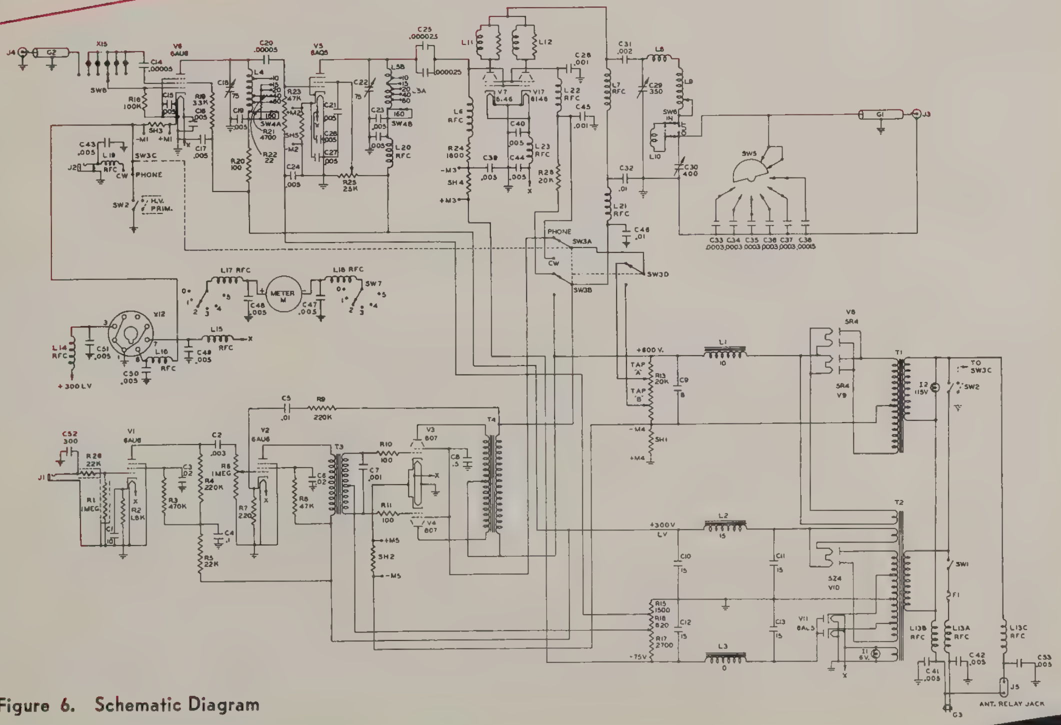


Figure 6. Schematic Diagram

The Viking II is available wired and tested by factory-authorized wiremen. The cost is nominal, see your JOHNSON distributor.

Amateur Net Complete with tubes, less crystals, key and mike

$279.50

In Kit Form.

JOHNSON *Viking* VFO KIT

Ideal for Use with most Transmitters

COMPANION UNIT FOR THE VIKING II . . .

The JOHNSON VFO is truly a precision instrument, engineered to the same high standards of appearance and performance which characterize the Viking II transmitter.

OUTPUT—VFO output is more than sufficient to drive the Viking or similar transmitters to full output on all amateur bands from 10 to 160 meters. Two entirely separate oscillator tanks are used, one delivering 8 to 10 volts on the 7.0 to 7.425 MC range, the other delivering 5.5 to 7.5 volts on the 1.75 to 2.0 MC range. Thus the maximum frequency multiplication required is 4X to cover the 10 meter band. The transmitter oscillator stage is utilized as an isolating RF amplifier or frequency doubler when driven by the VFO.

TUBE COMPLEMENT—The tube complement consists of a 6AU6 electron coupled oscillator and an OA2 regulator. Excellent isolation between oscillator and output circuits, and nearly perfect screen grid voltage regulation account for the clean keying and add to the overall stability of the VFO.

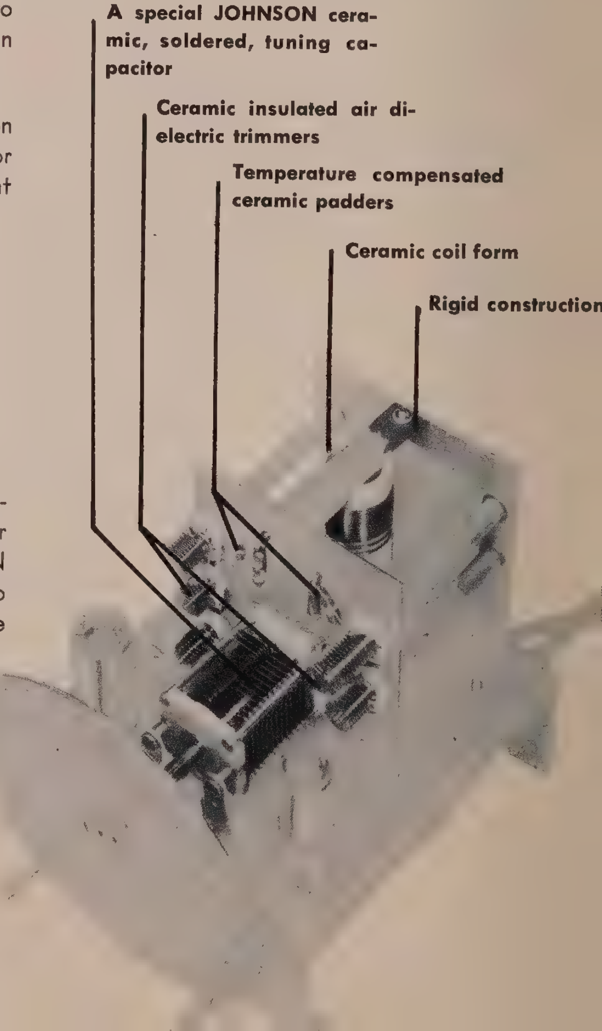
KEYS IN THREE DIFFERENT WAYS

1. Keying VFO alone.
2. Keying the transmitter alone.
3. Keying both the VFO and transmitter simultaneously. The latter is highly satisfactory and provides perfect "break-in" operating conditions on all bands.

POWER SUPPLY REQUIREMENTS—All voltage requirements are amply supplied from the VFO supply socket on the Viking Transmitter. No other power supply required, all necessary cables and plugs furnished. If the JOHNSON VFO is used without the Viking II, power supply requirements are 250 to 300v, unregulated at 15 ma and 6.3 v at .3 amp., ac or dc, usually available from existing transmitter power supplies.

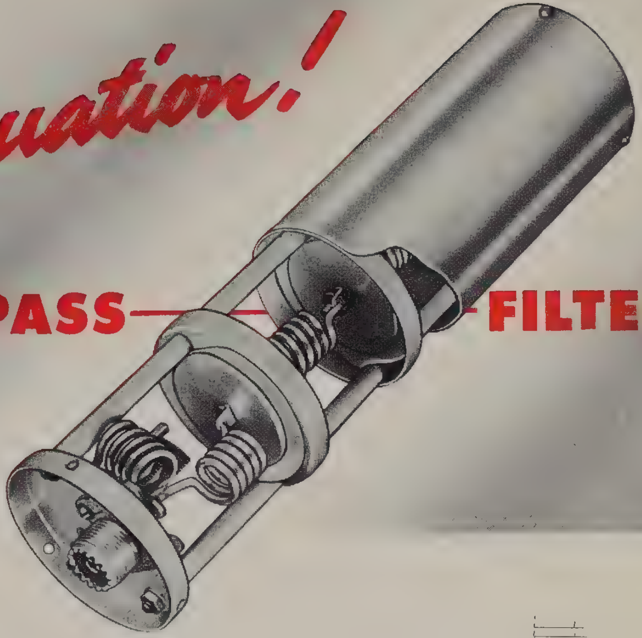
ASSEMBLY—Assembly and calibration are simple. A 5" dial, calibrated for transmitter output on all amateur bands from 10 to 160 meters is furnished. Instructions contain simple methods of alignment, insuring that output frequency agrees with dial calibration. A special tank assembly board is provided with the kit, to insure correct component mounting and wiring. The instruction manual contains complete details and schematics for operation with transmitters other than the Viking II.

Factors contributing to the excellent stability of the Viking VFO are:


A special JOHNSON ceramic, soldered, tuning capacitor
Ceramic insulated air dielectric trimmers
Temperature compensated ceramic padders
Ceramic coil form
Rigid construction

FOR INCREASED *Harmonic Attenuation!*

JOHNSON 250-20 LOW PASS—FILTE



BUILT-IN TILT BRACKET

Features;

1. **Accurate Frequency Calibration (All bands—160 thru 10 meters)**
2. **5" Calibrated Dial with 6:1 Reduction**
3. **High Stability—Clean Keying**
4. **Simple Assembly**
5. **Perfect "Break-In" on all bands**

JOHNSON VIKING VFO KIT, complete, less tubes, in dark maroon finished cabinet.

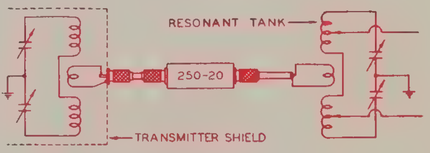
Size 7"x6⅞"x6 9/16
Amateur Net

$42 75

The JOHNSON 250-20 low pass filter consists of four individually shielded sections capable of handling more than 1000 watts amplitude modulated RF. Cut-off frequency is 45 mcs. with "M" derived end sections adjusted to provide maximum attenuation at 57 mcs., the center of TV channel 2. Attenuation of harmonic and spurious frequencies above 54 mcs. is 75 DB or more. Insertion loss is less than .25 DB. The 250-20 is immediately adaptable to any transmitter with a 52 ohm output. When properly terminated, the maximum voltage developed across capacitors is nomial, even at 1 KW power. In designing the JOHNSON Low Pass Filter, consideration was given the fact that the RF voltage could rise to extremely high values if the load were accidentally removed. Therefore, to enable the user to service the unit, the interior of the filter case has been made readily accessible and fixed capacitors have replaceable Teflon insulation.

With the many amateur transmitters, using low impedance links to couple to balanced antenna systems, some type of antenna coupler is required and use of a fixed impedance filter does not unduly complicate antenna loading. The antenna coupling shown in diagram is simple and quite flexible.

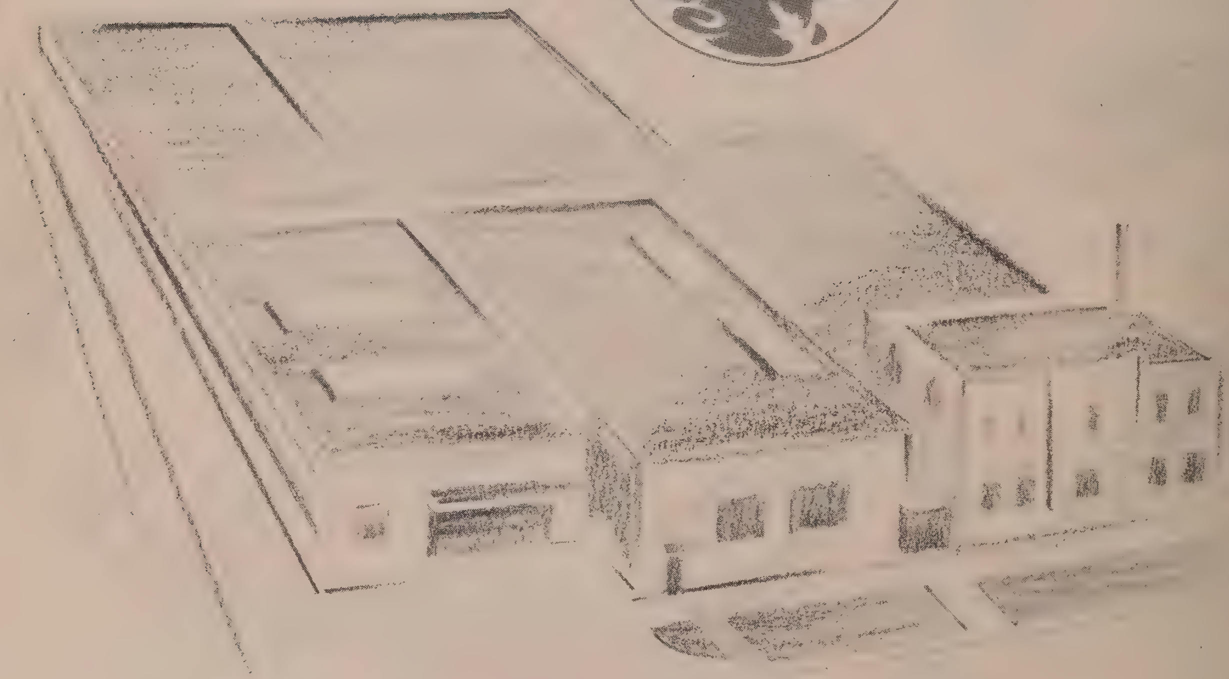
Owners of transmitters such as the JOHNSON Viking will have no difficulty feeding a 52 ohm line since the pi-network amplifier can match this impedance throughout its tuning range. The pi-network is also capable of tuning out considerable reactance.



Standard SO-239 coaxial connectors are used for input and output terminals. Completely assembled, pre-tuned and equipped with convenient mounting hardware.

250-20 Amateur Net

$16 5



E. F. JOHNSON COMPANY

WASECA, MINNESOTA

FORM 714M092 CATALOG NUMBER 714 PRINTED IN U.S.A.

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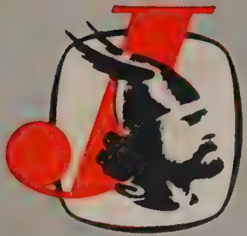

JOHNSON

ELECTRONIC EQUIPMENT

E. F. JOHNSON COMPANY
WASECA MINNESOTA

ASSEMBLY AND OPERATION
INSTRUCTION MANUAL

JOHNSON VIKING VFO

Introduction to the

JOHNSON VIKING MODEL 122 Variable Frequency Oscillator Assembly, calibrating, and Operating Instructions

Good workmanship and careful adherence to instructions are necessary in the building and operating of the Model 122 Variable Frequency Oscillator. Although the design of this VFO was carried out with the objective of reducing the number of critical circuits to a minimum and making assembly simple, the capacitor and inductor values of the tuned circuit components were necessarily chosen with a given parts layout; therefore, the builder should duplicate the layout shown in the illustrations and described in the text. Circuits should be checked against the schematic diagram during the several steps of assembly. Much time and effort may be saved by finding an error or deviation from the illustrated layout before the unit is completed.

The accuracy of frequency adjustments will be largely determined by the amateur's requirement and the standard he has available. The calibrating instructions should be understood before attempting to make initial frequency adjustments. After the frequency setting adjustments have been completed to the satisfaction of the user, there is little reason to expect much change with time; however, it is always wise to check the frequency calibration periodically if the VFO dial scale is depended upon for determining the frequency of the transmitter.

The Viking Model 122 VFO has only two controls. A little care in noting the position of the Bandswitch and the Tuning dial before completing transmitter tuning will assure the operator of a correct frequency indication. The operating instructions are very simple but important. Be certain they are understood before using the VFO.

WARNING

The Viking Model 122 VFO derives its power from the transmitter low voltage power supply or an auxiliary supply. The B+ source to the VFO must be off to remove the 250 to 300 volts from the VFO. The "plt off" position of the bandswitch does open the screen and plate circuits of the oscillator tube but the high voltage exists on other components.

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Viking Model 122 VFO Instruction Book

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A. Assembly Instructions

1. Bottom chassis assembly. Do not solder any connections until instructed to do so. Refer to Figure 1a.

   a. Mount X50, miniature 6AU6 oscillator socket. Use 3/16" 4-40 screws, inserting screw from the bottom of the chassis and securing the screw with a 4-40 nut over the socket shell lip above the chassis. Place a #4 shakeproof washer under each screw head and a #6 teardrop solder terminal under the mounting screw near the front of the chassis for ground connection. Pin 7 should be toward the rear of the chassis.

   b. Mount X51, miniature OA2 regulator socket, as above, the #6 solder terminal toward the front and socket pin 7 toward the rear of the chassis.

   c. Mount X52, five terminal strip. Use 1/4" 6-32 binding head screws with a single #6 solder terminal, and a #6 shakeproof washer under the front nut, and one #6 solder terminal, two #6 solder lugs (with wings), and a shakeproof washer under the rear nut.

   d. Mount J50, type A2A key jack, in the middle hole on the rear of the chassis, using only a single 3/8"-32 nut with no washer.

   e. Using a stripped piece of black #20 wire, connect the center shield, pin 2, and pin 3 to the #6 teardrop terminal under the mounting screw of the 6AU6 socket X50.

   f. Connect the center shield and pin 2 of the OA2 socket, X51, to the teardrop terminal under its mounting screw using the #20 stripped wire.

   g. Connect the 1/2 watt 47,000 ohm resistor R50 between pins 1 and 2 of the 6AU6 socket X50.

   h. Connect a .005 mfd. condenser C70 between pins 6 and 2 of the 6AU6 socket X50.

   i. Connect the 470 ohm 1/2 watt resistor R53 between the first and second terminals from the front on terminal strip X52.

   j. Connect a .005 mfd. condenser C68 between the #6 teardrop terminal under the front mounting nut and the second terminal from the front of X52.

   k. Connect the 4700 ohm 1/2 watt resistor R52 between the third and fourth terminals from the front of X52.

   l. Connect a 150 mmfd. NPO ceramic condenser C67 (bk-bn-gn-bn-or) between the rear and the second terminal from the rear of X52.

   m. Connect the 22,000 ohm 1/2 watt resistor R54 between the rear terminal of X52 and one of the #6 teardrop terminals under the rear mounting nut of X52.

   n. Mount the switch mounting bracket BKT53 with the lip toward the rear of the chassis. Use 1/4" 6-32 binding head screws, #6 shakeproof washers, and 6-32 nuts.

o. Place the switch SW50 on the bracket, guiding the shaft through the hole in the front of the chassis. Secure the switch to the bracket with the 3/8-32 nut and shakeproof washer furnished. The switch should be positioned so that the index ball will be on the right when the chassis is viewed from the bottom and front.

p. Mount the output coil L51 over the hole provided near the middle of the chassis. The coil should be placed so that the tapped portion with the lesser number of turns is toward the chassis and the terminated pins are toward the rear of the chassis. Insert the 1-3/4" 6-32 screw from the top of the chassis, running it through the coil form and securing the coil form with the small rectangular piece BKT55, a #6 shakeproof washer and a 6-32 nut. Be careful to center the coil so that the 1-3/4" 6-32 screw does not touch the pins which project through the coil form.

q. Using the #20 black plastic wire, connect the pin of the output coil near the chassis to pin 5 of the 6AU6 socket X50 and also to the second terminal from the rear of terminal strip X52. Solder all three terminals just connected.

r. Looking at the bandswitch SW50 from the rear, call the top terminal to the left of the steatite wafer mounting screw number 1, the terminal in the counter clockwise direction number 2 and so on through 12. Using a piece of #20 black plastic wire connect terminal 12 of SW50 to the middle tap of the output coil L51. Solder the connections

s. Connect terminal 11 of SW50 to the top pin of L51 and to the third terminal from the front of X52. Solder at the terminal strip only.

t. Connect terminal 10 of SW50 to the second terminal from the front of the terminal strip X52. Solder both terminals.

u. Connect terminals 5 and 7 of SW50, and connect terminal 5 of SW50 to pin 7 of the 6AU6 socket X50. Do not solder.

v. Cut one lead of the 22 ohm 1/2 watt resistor R55 and one lead of the 43 mmfd. (bl-yl-or-bk-or) NPO condenser C66 to 3/8" lengths. Connect the 3/8" leads together by forming hooks on each, crimping the hooks together and soldering the hooked connection. Slip a 1" piece of black insulation (stripped from the #20 wire) over the free end of C66 and connect that end to terminal 2 of SW50. Connect the free end of R55 to pin 1 of the 6AU6 socket X50 after cutting the lead so that C66 and R55 can be placed directly in line between the tube socket and the switch terminal. Solder the two connections.

w. Mount and connect the RF choke L52 between the tip terminal (insulated terminal at end of the jack) and switch SW50 terminal 5. Trim one RF choke lug to fit into the jack terminal and complete the connection to the switch terminal with a short piece of #20 wire between the other RF choke lug and switch terminal 5.

x. Connect a .005 mfd. condenser C69 between the tip terminal and the grounded sleeve terminal of the keying jack J50. Solder both terminals on the jack, the RF choke lugs, and terminals 5 and 7 of SW50

y. Connect the 18,000 ohm 2 watt resistor R51 between terminal 11 of the bandswitch SW50 and pin 1 of the OA2 socket X51. Solder both terminals.

z. Using a piece of #20 black plastic covered wire, connect pin 5 of the OA2 socket X51 and pin 6 of the 6AU6 socket X50. Solder these connections and all other connections which have not been previously soldered except those on bandswitch SW50.

2. Condenser-terminal board assembly.

a. Refer to Figure 1b. Connect a .001 mfd. silver mica condenser C59 between pins 1 and 5 of the condenser-terminal board CH55. Note the board is oriented so that there are three trimmer condenser mounting holes on the right holes on the right side and two on the left side. Loop the condenser leads over the terminal pins as near the board as convenient to allow room for other connections on the outside of the pins.

b. Connect another .001 mfd. silver mica condenser C60 between pins 5 and 7 in the same manner as in step 2a and solder both condensers lightly to hold them in place.

c. Connect a .0005 mfd. silver mica condenser C56 between pins 4 and 6 as shown in Figure 1b in the same manner as in step 2a.

d. Connect another .0005 mfd. silver mica condenser C58 between pins 6 and 8 as in step 2a. Solder C57 and C58 leads lightly.

e. Turn the condenser-terminal board around to the position shown in Figure 1c. Mount the 40 meter padder condenser C54, the 15M11 miniature condenser whose rotor terminal is on the right side when the stator is up and viewed from the rear. Use the nut provided on the condenser bushing.

All following condenser descriptions are from the rear view of the condensers.

f. Mount the 40 meter trimmer C52, the 9M11 miniature condenser with the stator terminal on top and the rotor terminal to the right, in the same manner as C54 was mounted.

g. Mount the 11 meter adjusting trimmer C56, the 15M11 miniature condenser in the lower hole on the left side. The stator terminal should be down and the rotor terminal to the right.

h. Mount 160 meter padder C61, the 30M8 miniature condenser, in the upper right hole, with the stator terminal on top and the rotor terminal to the left.

i. Mount the 160 meter trimmer, C63, 15M11 miniature condenser, in the hole below C61, with the stator terminal on top and the rotor terminal to the left.

j. Mount the dual stator tuning condenser C55 in the middle of the board as shown in Figure 1c. The threaded bushing should be secured to the board with a 3/8 - 32 hex nut. The stator terminals are on top and the rotor terminal is below the condenser. Be careful not to subject the condenser to undue strain at the bushing by dropping the assembly or applying force to the shaft.

k. Attach two mounting brackets BKT52 to the front mounting posts of C55 using two 1/4" 6-32 screws and #6 shakeproof washers.

l. Strip a piece of the black plastic #20 wire and connect the rotor terminal of C52 to the rotor terminal of C56 and the rotor terminal of C56 to pin 8 of the terminal board.

m. Using #20 stripped wire, connect the rotor of C63 to pin 7 of the terminal board, connect pin 7 to the rotor terminal of the tuning condenser C55, and connect rotor terminal of C55 to pin 8 of the terminal board. Solder all connections of steps k and l, except the rotors of C63 and C52.

n. Mount and connect the fixed 47 mmfd, N220 negative temperature coefficient, ceramic condenser C51 (yel-yel-vlt-bk-or) between the rotor terminal of C52 and pin 3 of the terminal board. Keep the leads straight and taut.

o. Connect the 43 mmfd. NPO zero temperature coefficient, ceramic condenser C53 (bk-yel-or-bk-or) between the left stator terminal of C55 and pin 3 of the terminal board.

p. Connect the 91 mmfd., N080 negative temperature coefficient, ceramic condenser C64 (rd-wt-bn-bk-or) between the rotor terminal of C63 and pin 2 of the terminal board.

q. Connect the 140 mmfd., NPO zero temperature coefficient, ceramic condenser C62 (bk-bn-yel-bn-or) between the right stator terminal of the large tuning condenser C55 and pin 2 of the terminal board.

r. Using the stripped #20 wire, connect the stator of C52 to the stator of C54 and the stator of C54 to pin 3 of the terminal board. The wire should be formed to pass inside of the padder condenser C54 stator and clear the stator by at least 1/8 inch.

s. As in previous step r connect the stator of C63 to the stator of C61 and the stator of C61 to pin 2 of the terminal board.

t. Connect the rotor of C54 to the left stator terminal of C55 with a piece of stripped #20 wire.

u. Connect the rotor of C61 to the right stator terminal of C55. Solder all connections which have not been previously soldered on the front side of the condenser board.

v. Turn the condenser-terminal board around to the position shown in Figure 1b, strip the ends and attach the plastic covered connecting wires, soldering the connections as the leads are attached. Proceed in the following order:

1) a 3" black lead to pin 8 of the terminal board ✓
2) a 7" green lead to pin 1 ✓
3) a 6" red lead to pin 4
4) a 6" yellow lead to pin 5 ✓
5) a 5" brown lead to pin 6 ✓
6) a 6" grey lead to pin 3 ✓
7) a 4" blue lead to the stator terminal of C56 (Figure 1c) ✓

w. Twist the green and yellow leads together, training them downward and slightly to the right as shown in Figure 1b. Twist the red and brown leads together, training them downward slightly to the right.

x. Bring the blue lead around the mounting board and twist it with the black lead as shown in Figure 1b.

3. Top Chassis Assembly

a. Place a 9/16" OD rubber grommet in the 7/16" hole just behind the condenser mounting board position as shown in Figure 2a.

b. Position the condenser mounting board assembly and place all of the wires through the grommet as shown in Figure 2a.

c. Secure the condenser terminal board brackets and the front tuning condenser brackets to the chassis by means of 1/4" 6-32 screws, shakeproof wahsers and 6-32 nuts. Place a #6 teardrop solder terminal under the nut near the grommet on the bottom side of the chassis.

d. Place the 3/8-32 panel bearing through the large hole on the flat dial support bracket BKT54. Secure with a 3/8-32 nut. Position BKT54 by slipping the bearing, with the threaded end toward the rear, over the shaft of the tuning condenser C55. Secure BKT54 to the chassis with three 1/4" 6-32 screws, 6-32 nuts, and #6 shakeproof washers. Center the bracket and mounting board assembly and tighten all mounting screws and nuts.

e. Place the dual oscillator coil L50 on the chassis directly to the rear of the condenser mounting board. The leads of the coil should be toward the front of the chassis and the spade studs should fall into the diagonally located holes on the chassis. Secure the coil with 6-32 nuts and shakeproof washers.

f. Connect the leads of the coil to the pins of the condenser-terminal board as directly as possible while clearing other leads and pins. Make connections as follows:

1) Bottom lead of lower coil to pin 1 of condenser board. (Refer to Figures 1b and 2a). Solder.
2) Top lead of lower coil to pin 2. Solder.
3) Bottom lead of upper coil to pin 4. Solder.
4) Top lead of upper coil to pin 3. Solder.

g. Mount and secure the rear trimmer coupling support bracket BKT50 at the rear of the chassis in position so that the large holes are in line with the trimmer shafts. Secure with two 1/4" 6-32 screws, 6-32 nuts and shakeproof washer.

h. Place the coil cupport bracket BKT51 assembly over the coil form with the yoke butt pieces separated so the butt pieces will fall over the coil form edge. Secure the brackets with a 3/16" 4-40 screw through the condenser mounting board CH55 and a 3/16" 4-40 screw and #4 shakeproof washer through the trimmer coupling support bracket BKT50. A shakeproof washer is not necessary against the phenolic board.

i. Loosen the top screws on the coil support bracket BKT51 and force the butt pieces against the coil form. While holding these pieces against the coil form, tighten the top screws to secure the butt pieces firmly against the coil.

j. Install an insulated coupling shaft assembly D53 shown in Figure 2a by placing the phenolic shaft through the rear coupling support bracket with the deep slotted end toward the trimmer condenser shaft. Place the engaging spring in the deep slot with the bowed end toward the condenser shaft so that the spring engages the condenser shaft slot and is compressed until the slots on the phenolic shaft straddle the rear coupling support bracket. Force a "C" washer over the slot of the phenolic shaft on each side of the bracket. Use long nose pliers to force the "C" washers on and close the opening somewhat if the "C" washer has been spread enough to make it possible to drop off the shaft. Repeat the coupling shaft installation procedure for the remainder of the coupling shafts.

4. Bandswitch, Cable, and Plug connections.

a. Refer to Figure 1a. Cut, strip ends, and connect the wires from the condenser mounting board to the bandswitch SW50. Refer to 1r for SW50 terminal numbering. Complete connections as follows:

1) Green to terminal 1
2) Yellow to terminal 4
3) Red to terminal 3
4) Brown to terminal 6
5) Blue to terminal 8
6) Gray to terminal 9
7) Black to the terminal under the nut of the condenser board mounting screw.

Solder all connections on SW50 and the ground terminal

b. RG59U and PL259 cable and plug assembly, G50 and PL50. The length of the coax cable G50 must be left at the length supplies as it is electrically part of the broadly tuned output circuit.

1) Cut and remove 1-1/4" of outer vinyl cover from one end of the RG59U cable.

2) Push the UG176U adapter over the cable end with the threaded end first. Position the adapter to expose 1" of the copper braid beyond the adapter. If the adapter fits very tightly on the vinyl cover, reduce the diameter of the cover by filing or slicing the surface very thinly about 1/2" back with a sharp knife until the adapter slides over the cover.

3) With the thin lip of the adapter 1" from the end of the cable, whose vinyl covering has been removed, comb the braid wires and lay them back evenly over the adapter lip. Cut off the excess braid strand length 3/8" back so that the braid strands do not reach the adapter threads.

4) Holding the adapter in place, cut and remove 9/16" of polyethylene insulation from the end, exposing the inner conductor.

5) Turn the outer knurled cylinder off of the coaxial plug PL259. Pass the inner plug part over the end of the cable, guiding the inside of the plug pin over the inner conductor. Turn the plug to engage the adapter UG176U threads and tighten the two parts together with gas pliers and vise or other suitable tool.

6) Solder the inner part of the plug to the braid wires and adapter at the cutaway section holes. Use a hot iron and run in a small amount of solder through each hole, flowing the solder over the braid wires.

7) Solder the inner conductor to the tip of the pin and cut off the excess inner conductor.

8) Screw the outer PL259 cylinder over the plug inner piece.

d. Three conductor cable and octal connector assembly G51 and PL51.

(1) Remove the shell from the 8 prong plug PL51 by prying with a screw driver.

2) Remove the outer covering and unbraid 1-1/2" of shield braid on one end of the 3/c cable. Divide the loose shield strands in two parts and twist the strands of each part together. Strip 1/2" of insulation off each of the three conductors.

Insert the twisted braid conductors in pins 1 and 2 of the plug, pull through the pins 1/4" and solder. Insert and solder each of the three conductors to pins of the plug, allowing each to extend 1/16" beyond the pin end as follows:

1) Black tracer to pin 8
2) White tracer to pin 7
3) Red tracer to pin 3
4) Trim excess wire off all pins when the connections to the pins have been completed.

Place the plug shell over the cable and secure it to the plug proper.

d. Place 9/16" rubber grommets in the two remaining 7/16" holes at the rear of the chassis.

e. Remove the outer cover and comb out the braid on 6" of the free end of the 3/c cable. Cut off all but 1" of the braid and twist the remaining part together tightly. Insert the free end of the cable through the rear inner 7/16" grommeted hole of the chassis, as shown in Figure 1a, and place the twisted braid wire in one of the #6 soldering lugs under the rear mounting nut of terminal strip X52. Crimp the lug over the shield wire and solder. The lug should be positioned to take the strain of the cable.

f. Cut to length and connect the black tracer lead to the transfer contact terminal of the key jack J50 (the rear terminal). Solder. Connect the white tracer lead to pin 4 of the 6AU6 socket X50. Solder. Connect the red tracer to the front terminal of X52. Solder.

g. Remove the vinyl cover and comb out 1 1/4" of shield braid on the unconnected end of the RG59U cable G50. Cut 1/2" off the braid wires and twist them together tightly. Remove 3/8" of polyethlene from the end of the cable exposing the inner conductor.

h. Insert the cable through the outer grommeted hole of the chassis as shown in Figure 1a and place the twisted shield wire in the remaining #6 soldering lug under the rear mounting screw of X52. Crimp and solder the lug to the shield wire. The lug should take most of the cable strain.

i. Connect the inner conductor of the RG59U to the rear terminal of the terminal strip X52. Solder.

5. Dial Drive Assembly D51. Refer to Figures 1a and 2a.

a. Place the bearing and shaft assembly through the remaining 7/16" hole in the front of the chassis, the long shaft end extending out and the bearing threads into the chassis. Fasten with a 3/8-32 nut.

b. With the hubs toward the chassis, push the friction drive wheel and the drive disc on the chassis shaft and tuning condenser C55 shaft at the same time. The large friction disc should be engaged by the twin drive wheel discs. Tighten the drive wheel setscrews in a position where the dial drive disc is not bent by the drive wheel when the outside of the drive disc dial mounting plate is even with the condenser shaft end. Tighten the drive disc set screws to the condenser shaft temporarily, paying no attention to its position relative to the condenser rotor.

c. Attach the calibrated dial plate to the mounting plate with the three short flat head 6-32 screws, orienting the dial so that the 7.425 and 1.75 mc markings are on the same side of the shaft as the setscrews on the dial drive disc hub.

d. Assemble the index plate to the front panel. Do this with care to prevent scratching the panel. Place the two flat head 4-40 screws through the holes near the upper part of the window opening. Place two #8 washers over each screw at the rear of the panel to serve as a spacer. Place the index plate over the screws with the index marker toward the front and bottom of the panel. Secure the index plate in its maximum upward position with two 4-40 nuts and lockwashers.

6. Preliminary tests and checkout.

a. Look over the entire completed assembly at this time, checking for unsoldered connections and loose nuts or screws. Make a thorough examination of all connections and check back on the assembly instructions if some connection appears to be incorrect.

✓ b. Plug in the 6AU6 and OA2 tubes in their respective sockets. Place a shield can over the 6AU6 tube. Make the following tests before the panel and cabinet are assembled.

✓ c. Attach the VFO knobs to their shafts temporarily. Turn the bandswitch to the counter clockwise position (plt off).

d. Plug the power supply octal connector PL51 into the transmitter VFO supply socket or the socket on an auxiliary power supply. Turn on the transmitter low voltage or auxiliary power supply switch after making certain the "drive" control to the final tube of the transmitter is set at its minimum value. Check the lighting of the 6AU6 tube filament. The OA2 should have no glow.

e. Turn the bandswitch to the next position clockwise (160 80 40). The OA2 tube should now have a violet glow between its electrodes.

f. Attach a short antenna wire 1-1/2 to 2 feet long to the output coax plug PL50. Set up a receiver, whose calibration is correct within 25KC on the 160 meter band and 50KC on the 40 meter band, 5 to 25 feet from the VFO.

g. Turn all trimmers and padders to their half value position and set the main tuning condenser C55 so that the rotor plates are completely engaged with the smaller stator section. With no key in the VFO or transmitter, or with the key closed, a VFO signal should be heard in the receiver (Beat frequency oscillator on) around 1.95 to 2.05 mc. It may be possible to pick up a weaker image signal 900 KC from the wanted signal but it should be ignored in all cases. Harmonics of the 1.95 to 2.05 mc. signal may be used if the receiver cannot tune the 160 meter range.

h. Turn the main tuning condenser to engage the large stator completely. Turn the bandswitch to the next position clockwise (40 20 15 10). A signal should now be heard from 7.35 to 7.7 mc. Ignore the image signal as before.

i. Leaving the main tuning condenser in the position of step h, turn the bandswitch to the maximum clockwise position 11 (11 meter). A signal should now be found between 6.8 and 7.3 mc.

. If no signal is found near the ranges indicated in any of the previous steps, first couple the receiver to the VFO closer than before and try again. If no signal is heard or the signals are out of the ranges, check all the condenser values and the condenser-coil connections on the condenser board with earlier instructions and the schematic diagram. Check the bandswitch connections with the instructions and the schematic diagram.

j. Remove the short VFO antenna from the output plug and plug the PL259 RF plug into the transmitter VFO receptacle. Turn the transmitter crystal selector to the VFO input position and check the VFO for sufficient transmitter drive on all bands. If insufficient VFO output signal is noted, check the output coil L51, bandswitch, and terminal board X52 connections. It should be kept in mind that the transmitter must be capable of being driven by 5.5 volts or less on bands utilizing the 160 meter VFO output and 8 volts or less on bands utilizing the 40 meter VFO output; also, that the output circuit of the VFO includes the input circuit of the transmitter. The total input circuit of the transmitter at the VFO output plug PL259 should have a capacity of approximately 35 mmf. (one foot of RG59U cable is 22 mmfd.) and a shunt resistance of 20,000 ohms or higher. Refer to Operating Instructions, part C, for a discussion of the VFO output characteristics.

7. Bottom, rubber bumper, and tilt stand assembly. Refer to Figure 3a.

a. With the lip of the bottom cabinet piece oriented downward and forward, fasten the two rear bumpers G54 with 3/8" x 6-32 screws, flat washers, #6 shakeproof washers and 6-32 nuts.

b. Place the front rubber mounting feet over the tilt stand mounting brackets BKT56 as shown in Figure 3a and secure to the cabinet bottom with 3/8" 6-32 screws, flat and lock washers, and 6-32 nuts. Before tightening the nuts, slip the tilt stand in place under the curved ends of the brackets with the tilt stand inner ends extending out from the surface of the bottom plate. Now tighten the 6-32 nuts while holding the tilt stand and tilt stand brackets in place. Try the tilt stand action by moving it upward through an arc of 100 degrees. The tilt stand should not move beyond that position. Return the tilt stand to its former position against the bottom piece.

8. Chassis, cabinet, and escutcheon assembly. Marring and scratching of the painted surfaces of the panel and cabinet by screw driver slippage can be avoided by placing a piece of cardboard with a hole slightly larger than the screw head over the screw head while driving the screws in the following steps.

a. Remove the knobs from the chassis shafts and slide the front panel over the shafts in the position it will be finally mounted. This step will serve to check shaft alignment without placing the chassis in the cabinet. Note any binding or strain and adjust the drive shaft bushing or bandswitch bracket to correct any poor alignment which may be indicated. Lightly oil the control shafts (where they will pass through the panel) and the tuning shaft bushing-bearing.

b. Place the cabinet bottom piece CH51 over the cabinet lower lips. The orientation of the cabinet sides and back can be determined from Figure 2b. Attach the bottom piece to the sides with four #4 sheet metal screws and #4 shakeproof washers. Place the washers under the screw heads. Do not tighten screws completely but allow some shifting of the bottom for final alignment. The shakeproof washers will assure good electrical contact.

c. Place the plugs and cables of the chassis through the large hole in the back of the cabinet, locate the chassis in the cabinet and turn a 3/8-32 nut on the 3/8 key jack bushing . Tighten with fingers only. Allow the nut on the chassis to act as a spacer between the cabinet and chassis. Attach the front of the chassis to the bottom piece with two #4 sheet metal screws and #4 shakeproof washers. Attach the rear of the bottom piece to the cabinet with two #4 sheet metal screws and #4 shakeproof washers, keeping the screws in front of the rear chassis edge. Do not tighten any of the screws completely.

d. Attach the front panel to the cabinet and bottom piece with six #4 sheet metal screws and shakeproof washers. Be careful not to mar the panel or dial plate in this step. Do not tighten screws completely until other screws have been tightened and the top piece has been fitted to assure that the screw holes line up satisfactorily when it is finally secured to the cabinet. Do not secure the top to the cabinet at this time but line up the holes while tightening the bottom screws, chassis screws, and panel screws in the order listed.

e. Loosen the index plate screws and move the index plate so that a 1/32" gap exists between the convex surface of the index plate and the dial edge.

f. Loosen the main dial hub and move the dial until the dial marking between the 7.425 and 1.75 mc markings is in line with the index plate mark when the main tuning condenser C55 rotor plates are completely meshed with the large stator. Although the dial mark is below the dial edge, this setting should be made carefully and checked with the dial mark 180 degrees away which corresponds to the rear rotor plates being completely meshed with the small stator. The dial hub setscrew should be tightened in position with the dial plate front surface approximately 1/32" back of the index plate front surface. In most cases the dial position relative to the condenser shaft will not require further change. The calibrating instructions include procedures for making the change if it is necessary.

Attach the dial window escutcheon to the front panel with the two small 2-56 screws provided. The screw will self tap into the aluminum. Do not tighten the screw too hard; the self tapped threads may strip. The wide side of the escutcheon should be at the lower edge of the dial window.

g. Attach the knobs to the shafts. Space the back of the knobs 1/8" from the panel. Tighten the tuning knob setscrew while the knob mark is in any position relative to the shaft rotation. Turn the bandswitch shaft to its maximum counterclockwise position and locate the bandswitch knob on the shaft so that the marker lines up with the "plt off" designation. Tighten the knob setscrew securing the knob in this position. Attach VFO cover using six #4 sheet metal screws and shakeproof washers. If shaft binding is noted, remove the bottom piece and realign the tuning shaft bushing to relieve the binding.

B. Frequency Adjustment and Calibration

1. Signal generator, receiver, and VFO setup for the Viking Model 122 VFO calibration.

a. The accuracy of the Viking Model 122 VFO will be no better than that of the signal generator used to calibrate it. To fully utilize the stability and calibration capabilities of the Viking Model 122 VFO, the frequency standard used to calibrate it should have an accuracy of .005% or better. Most crystal standards or crystal calibrated variable frequency standards are satisfactory for normal calibration purposes. A moderate signal output, capable of being easily detected by the receiver which will be used for zero beat indication, is necessary at the following frequencies:

F1a Any given frequency (preferably a VFO low frequency scale mark frequency) between 1.75 to 1.78 mc or any of the first eight harmonics of 1.75 to 1.78 mc in the range of the receiver. 1.76, 3.52, 5.28, 7.04, and 8.80 mc are examples of crystal frequency possibilities.

F2a Any given frequency (preferably a VFO low frequency scale mark frequency) between 1.96 and 2.00 mc or any of the first eight harmonics of 1.96 to 2.00 mc in the range of the receiver.

F3a Any given frequency (preferably a VFO high frequency scale mark frequency) between 7.00 and 7.07 mc or any of the first four harmonics of 7.00 to 7.07 mc in the range of the receiver.

F4a Any given frequency (preferably a VFO high frequency scale mark frequency), between 7.35 and 7.425 or any of the first four harmonics of 7.35 to 7.425 mc.

Warm up the signal generator for a least 1/2 hour or as long as suggested by the signal generator instructions before using it for VFO calibration.

b. Set up a receiver capable of detecting each of the frequencies chosen in 1a. Attach antenna leads to the receiver input and the signal generator output and bring the leads together until signal generator output can be picked up by the receiver. Separate and shorten the leads as found necessary to keep the receiver from blocking due to excessive signal input. Allow the receiver to warm up for about 1/2 hour, to stabilize the local oscillator, and log dial settings for frequencies F1a, F2a, F3a, and F4a. The beat frequency oscillator in the receiver may be used to log and compare the signal generator and VFO frequencies but it is desirable to obtain the final zero beat indications between the VFO and signal generator signals without the beat frequency oscillator. Avoid setting the receiver on or logging image frequencies.

c. Warm up the Viking Model 122 VFO for 1/2 hour with the band switch in the 160 80 40 position. Attach an antenna lead to the output coax plug pin and bring the lead near the receiver antenna. Turn the VFO dial to the frequency F1, between 1.75 and 1.78 mc. chosen as the low 160 meter calibrating point, and find it or its harmonic (near F1a) on the receiver. Note how close the VFO calibration is initially. Repeat the same procedure at the high 160 meter calibrating point and the 40 meter high and low points after moving the bandswitch to the 40 20 15 10 position.

2. 160, 80, 40 meter VFO scale calibration.

a. Set the VFO bandswitch on the 160 80 40 position and the dial at F2, the frequency between 1.96 and 2.00 mc chosen for the high 160 meter calibrating point. Set the signal generator and the receiver at F2a. Adjust the "160 hi" trimmer at the rear of the VFO (refer to Figure 2b) until the VFO zero beats with the signal generator.

b. Turn the VFO to F1, the receiver to F1a, the signal generator to F1a and adjust the "160 lo" padder until the VFO zero beats with the signal generator.

c. Repeat the "160 hi" and "160 lo" adjustment, zero beating the signal generator and VFO as accurately as the ability to resent the two units warrants.

3. 40, 20, 15, 10 meter VFO scale calibration.

a. Set the VFO bandswitch on the 40 20 15 10 position and the high frequency dial scale at F 4, the frequency between 7.35 and 7.425 mc chosen for the high 40 meter calibration. Set the signal generator and the receiver at F4a. Adjust the "40 hi" trimmer at the rear of the VFO until the VFO zero beats with the signal generator.

b. Turn the VFO to F3, the frequency between 7.00 and 7.07 mc chosen for the low 40 meter calibration, the receiver to F3a, the signal generator to F3a, and adjust the "40 lo" padder until the VFO zero beats with the signal generator.

c. Repeat the "40 hi" and 40 lo" adjustment, zero beating the VFO as accurately as the ability to reset the two units warrants.

4. 15 and 11 meter index marking and 11 meter calibration.

a. Set the VFO dial on the 7, 14, 28 mc mark. Place a light pencil mark or scratch on the escutcheon window starting at the lower inside edge in line with the 21 mc. mark. Carefully remove the escutcheon window and make the mark deeper across the lower inside edge with a thin hacksaw blade or similar tool. If a more elaborate index marker is desired for the 15 and 11 meter band, a right angle piece of #24 or #22 wire, 1/8" on each leg, can be formed and cemented into the slot with the protruding leg on the inside edge extending toward the 21 mc mark when the escutcheon window is again replaced.

b. The 11 meter band VFO output is in the neighborhood of 6.75 mc. A given frequency, F5a, in the range 6.7 to 6.85 mc or any of the first four harmonics of the 6.7 to 6.85 mc range may be used to calibrate the 11 meter range. Turn the VFO bandswitch to the 11 meter position and set the dial scale of the 11 meter band on the standard frequency F5 or the harmonic of the standard signal which falls in the 11 meter band. Set the receiver to the 11 meter range or a subharmonic and detect the standard signal frequency. Adjust the "11 meter" trimmer until the VFO zero beats with the standard frequency.

c. Recheck the 40 20 15 10 calibration after the 11 meter adjustment. There is little likelihood that further readjustment is necessary unless a large change was required in the "11 meter" setting.

5. VFO Calibration Using the Transmitter Crystal Oscillator or other Standard Signal Sources.

a. Crystals of known frequency and accuracy in the frequency ranges F1a, F2a, F3a, and F4a (designated in paragraph B1a) can be used in the transmitter crystal oscillator to provide standard frequency signals for the VFO calibration. The first stages of the transmitter must be arranged to allow the crystal oscillator to operate at the same time the VFO is operating. When the VFO is used with the Viking II transmitter, the phone cw switch must be in the "cw" position, the crystal switch on the position of the desired crystal, and the keying circuit closed (the Viking II keying circuit is closed when no key plug has been inserted). If the signal from the transmitter oscillator cannot be detected by the receiver readily, an antenna lead may be added by placing one end of a two or three foot lead in the vicinity of the oscillator tank coil and bringing the other end outside of the transmitter cabinet. The crystal oscillator signal magnitude can also be built up by tuning the plate circuit of the crystal oscillator to the crystal frequency or its harmonics. The VFO frequency can now be compared to the crystal oscillator frequency and adjustments can be made according to the procedure previously outlined in B4.

b. An example of calibrating the VFO using actual crystal values may be helpful. Assume that the following crystals have been found as part of the amateur station equipment: 7060 KC, 3690 KC, and 1980 KC. The dial calibration points then become:

$$F1 = \frac{7.060}{4} = 1.765 \text{ mc}$$

$$F2 = 1.980 \times 1 = 1.980 \text{ mc}$$

F3 = 7.060 x 1 = 7.060 mc

F4 = 3.690 x 2 = 7.380 mc

The receiver setting and VFO harmonic which may be used for each respective dial calibration frequency becomes:

F1a = 7.060 x 1 = 7.060 mc

F2a = 1.980 x 4 = 7.920 mc

F3a = 7.060 x 1 = 7.060 mc

F4a = 3.690 x 2 = 7.380 mc

Proceed as follows:

1) Set the VFO bandswitch on 160 80 40 and the dial on the 1.980 mc mark. Zero beat the fourth harmonic of the VFO output with the fourth harmonic of the 1.980 mc crystal oscillator output by adjusting the "160 hi" trimmer.

2) Set the VFO dial on the 1.765 mc mark and zero beat the fourth harmonic of the VFO signal with the 7.060 mc crystal oscillator signal by adjusting the "160 lo" padder. Repeat steps 1 and 2 to minimize adjustment interaction.

3) Set the VFO bandswitch at 40 20 15 10 and the dial on the 7.38-29.250 mc high frequency scale mark. Zero beat the VFO signal with the second harmonic of the crystal oscillator signal by adjusting the 40 "hi trimmer".

4) Set the VFO dial to the 7.060-28.240 mc mark. Zero beat the VFO signal with the crystal oscillator signal by adjusting the "40 lo" padder. Repeat steps 3 and 4 to minimize adjustment interaction.

5) The 11 meter band setting may be made with a crystal which will place a harmonic signal in the 11 meter band. Assume a 1820 KC crystal is available. Set the VFO bandswitch on 11 and the dial on 27.3 mc (the 15th harmonic of 1.820 mc). Zero beat the fourth harmonic of the VFO to the 15th harmonic of the crystal oscillator with the "11 meter" trimmer. Make certain that the receiver is tuned to the correct harmonic before attempting to make the 11 meter setting.

c. The user may think of several sources of standard signals other than those mentioned. In each case the accuracy of the source should be known before using it. Many combinations of harmonics can be found and no attempt has been made to cover all of them in this discussion. The beat frequency oscillator of the receiver can be used to "remember" a standard signal for a short time. The receiver must be thoroughly warmed up and operated without excessive input signal to prevent local oscillator shift errors from being introduced. Other signal sources which may be used by not discussed are:

1) The signal of another amateur station whose frequency has been determined by a standard.

2) The harmonics of a signal generator whose output signal has been zero beat with a broadcast station.

3) Signals of W W V discussed in the next topic.

The VFO user must adapt his techniques to the signal source he has available.

d. Band edge crystals or crystals near the usual operating frequencies of the amateur stations are always valuable for occasional monitoring of the VFO signals. They may be used in a separate oscillator circuit or the crystal oscillator stage of the transmitter.

6. VFO calibration using the W W V 10 mc signal. This calibration is not recommended if other standard signal sources are available. It will be noted that most calibration points are on the ends of the bands and the 40 20 15 10 band **high** scale calibration includes the tracking error of the low frequency 160 80 40 band. The receiver, the receiver BFO, and the VFO should be warmed up for 1/2 hour before calibrating.

a. 160, 80, 40 meter calibration.

1) Zero beat the receiver BFO to the 10 mc W W V signal.
2) Set VFO dial at 2.00 mc and the bandswitch on 160 80 40.
3) Adjust the "160 hi" VFO trimmer until the fifth harmonic of the VFO is zero beat with the receiver BFO.
4) Leaving the VFO at this setting, zero beat the receiver BFO with the seventh harmonic of the VFO (14 mc).
5) Turn the VFO to 1.75 mc and adjust the "160 lo" VFO trimmer to zero beat the eighth harmonic of the VFO with the receiver BFO.
6) Adjust both ends of the 160 80 40 bands to zero beat the eighth and seventh harmonics of the VFO with the receiver BFO as necessary.

b. 40, 20, 15, 10 meter calibration.

1) Set the VFO dial at the 1.85 mc mark and zero beat the receiver BFO to the eighth harmonic of the VFO frequency at 14.8 mc.
2) Set the VFO bandswitch to 40 20 15 10 and the dial to the 7.40-29.6 mc mark. Zero beat the second harmonic of the VFO to the 14.8 mc receiver of the VFO to the 14.8 mc receiver setting by adjusting the "40 hi" trimmer.
3) Set the VFO bandswitch and dial for 1.75 mc output again and zero beat the receiver BFO at 14 mc. Set the VFO bandswitch and dial at the 40 20 15 10 band low frequency end (7.00, 14, 21 and 28 mc) and adjust the 40 "lo padder" to zero beat the VFO second harmonic with the receiver 14.0 mc BFO setting.
4) Repeat steps 1, 2 and 3 if greater accuracy is desired.

c. 11 meter calibration.

1) Set the VFO bandswitch and dial for 1.80 mc output.
2) Tune the receiver to 27 mc and zero beat the receiver BFO to the 15th harmonic of the VFO.
3) Set the VFO bandswitch on 11 and the dial on 27.0 mc. Adjust the "11 meter" trimmer to zero beat the fourth harmonic of the VFO to the receiver BFO setting.

7. Procedure if the VFO frequency cannot be adjusted to the dial markings due to apparent lack of trimmer or padder range.

a. Check to make certain the frequency standard used is accurate (crystal used in amateur service are often found to differ from their marked frequency due to holder conditions, oscillator circuit loading or non-critical original calibration).

b. Make certain image frequencies are not being mistaken for desired frequencies in the receiver.

c. If after checking the frequency standard and receiver settings, the VFO frequency cannot be adjusted to chosen dial marks, adjust the trimmers and padders to bring the VFO frequency as close as possible to the dial mark frequencies. Remove the VFO cover and recheck the dial location relative to the tuning condenser shaft according to paragraph A 8e. If the dial requires relocating, try calibrating the VFO scale again, as directed in previous instructions, with the top off. If the calibration appears normal, replace the cover and recheck all calibration points with the cover on.

d. Upon removal of the cover in step c, if the dial location is found to be correct, note the engagement of the trimmers and padders.

   1) If any padder or trimmer is fully engaged and all of the others are engaged 1/4 or more, loosed the dial hub setscrews and move the dial counter clockwise with respect to the tuning condenser shaft (keeping the shaft stationary) an amount corresponding to 1/16" on its periphery.
   2) If any of the padders or trimmers is completely open, move the dial clockwise, with respect to the condenser shaft, an amount corresponding to 1/16" on the dial periphery.
   3) If any of the trimmers or padders is closed and the corresponding trimmer or padder on the same band is open, add a 6.8 mmf ceramic NPO condenser (bk-bl-gy-wt-gn) (C50 or C65) across the closed padder or trimmer to extend its range.

If the VFO can now be tracked to the dial, replace the cover and complete calibration.

C. Operation

1. General operating characteristics and requirements.

a. The Viking Model 122 VFO has been designed as a crystal substitute. The output of

a minimum of 8 volts r.m.s. across 25,000 ohms in the frequency range of 7.00 to 7.425 mc and
a minimum of 5.5 volts r.m.s. across 25,000 ohms in the frequency range of 1.75 to 2.00 mc.

may be applied across the crystal oscillator grid circuit of many transmitters directly, to take the place of 160 meter and 40 meter crystals normally used with the transmitters. A recommended basic transmitter first stage oscillator-amplifier circuit and a recommended booster amplifier will be discussed later for transmitters where more VFO isolation or output is required.

b. The VFO has only two controls. It is imperative that the correct dial scale corresponding to the bandswitch position is at the index window when operating.

The VFO will drive many transmitters on 40 meters in either the 160 80 40 or 40 20 15 10 bandswitch positions. The 160 80 40 meter position is usually preferred for 40 meter operation because the chance of "straight through" feedback is eliminated. The bandswitch setting for all other bands should be on the indicated band. Suitable frequency multiplication must be provided in the transmitter exciter stages.

c. The output circuit of the Viking Model 122 VFO is a broadly tuned circuit which depends on the output cable and the transmitter input capacity to some extent. It is therefore impossible to obtain full VFO output with a cable length, between the VFO and transmitter, that differs markedly from that provided with the VFO. The transmitter total input capacity should be between 30 and 40 mmf to center the VFO maximum output in the VFO frequency ranges (the Viking II transmitter has a one foot length of RG59U, the VFO input jack, and the tube input capacity to make up approximately 30 mmf.).

d. Keying can be arranged so that the VFO is keyed by the transmitter keying circuit. Pin 8 of the VFO power plug carries the keying circuit. With such an arrangement the VFO simply becomes a frequency determining device and normal operating techniques of crystal transmitter operation apply. If it is desired to key the transmitter stage alone while the VFO is allowed to operate continuously, a shorted plug should be plugged into the rear VFO key jack. If it is desired to key the VFO without keying the transmitter, simply remove the key plug from the transmitter and insert the key plug in the VFO keying jack.

e. When the transmitter is operated "straight through" with the VFO on 160 meters or 40 meters, avoid placing the VFO in a location where high output RF fields reach the VFO. Although the rather complete shielding on the VFO will keep the likelihood of frequency pulling to a minimum, the high sensitivity of the low level VFO oscillator circuit may make a very slight feedback troublesome.

f. "Zero beating" receiver signals with the VFO may require the reduction of the transmitter exciter leakage to the receiver. Two ways to do this are:

   1) Disabling the first stage of the transmitter while the VFO is allowed to oscillate. The VFO-to-receiver signal may be fed out by a small auxiliary lead in the circuit of the VFO output at the transmitter.

   2) Disconnecting the VFO from the first stage of the transmitter by the crystal VFO selector switch. The sensitivity of the first transmitter stage may be so high that the switch terminal to terminal capacity may still couple enough VFO signal to the first stage to create a signal level in the receiver sufficient to mask the received signal. In this case, provision for attenuating the VFO signal at the first stage can be incorporated in the crystal VFO selector switch. The crystal positions 1 and 2 of the Viking II transmitter lend themselves nicely when resistors are placed between the outside jacks of the crystal positions and a chassis ground. The resistors thus shunt the grid of the input stage to ground when the crystal switch is put in the 1 or 2 positions. The value of the resistor can be adjusted to attenuate the signal to the degree desired.

g. The power requirement of the Viking Model 122 VFO.

An auxiliary power supply or the low voltage power supply of the transmitter must be capable of supplying 250 to 300 volts of plus D.C. to chassis ground at 15 ma and 6.3 volts A.C. to chassis ground at .3 ampere. The 250 to 300 volt supply may be unregulated but it should not be subject to sudden voltage changes or excessive voltage change with a change of 5 to 10 ma current drain. An octal socket is a natural connecting device for the octal plug provided on the VFO.

2. Operation with the Viking II Transmitter. Most of the comments made under General Characteristics apply to the use of the VFO with the Viking II. A few details and suggestions are included to help the Viking II owner make his initial installation.

   a. Plug the VFO power plug in the VFO socket in the left rear corner of the chassis. The VFO output coax plug should be plugged in the input receptacle below the fuse plug. Check both the RF input lead and VFO power lead for correctness of wiring, continuity and shorts if any difficulty arises in obtaining VFO drive.

   b. The crystal selector of the Viking II must be in the "0" position for VFO operation. Band edge or other calibrating crystals may be place in any crystal position and referred to simply by turning the crystal selector to the proper position.

   c. The discussion of keying under general operating characteristics applies directly to the Viking II. When the Viking II is on "phone" the keying circuit is opened when the plate switch is turned off. If no plug has been inserted in the VFO the phone-cw switch must be placed on "cw" to close the VFO keying circuit when the plate switch is off. The method of checking the VFO frequency in the receiver is to turn the phone cw switch to "cw". If the exciter coupling to the receiver is too great, turn the crystal selector switch to an empty or shunted crystal position to reduce the signal as discussed in Clf.

3. Operation with other transmitters.

   In general the Viking Model 122 VFO output will be applied at the grid circuit of the crystal oscillator of a transmitter. Some considerations which must be made when the VFO is to be used with a given transmitter are:

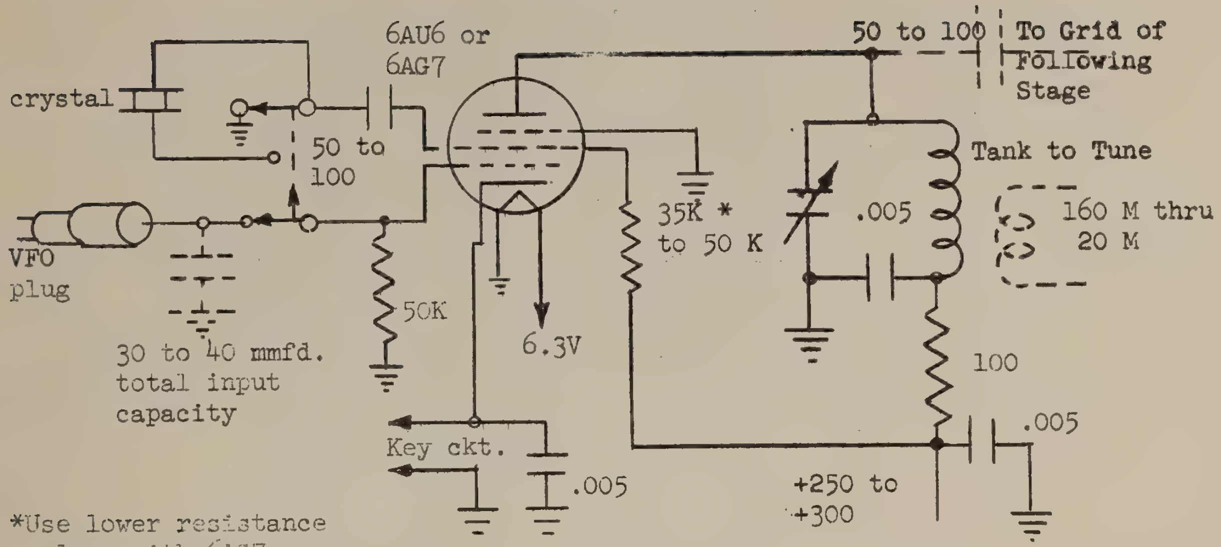
   a. Power supply for the VFO (discussed in Clg)

   b. The power sensitivity of the first stage of the transmitter. The voltage output of the VFO (listed in Cla) must be sufficient to drive the transmitter first stage to a value necessary for the required amplification or frequency multiplication.

   c. Sufficient isolation between the tuned tank circuit of the first transmitter stage and the VFO must be provided to prevent feedback effects when that tank circuit is tuned to the VFO frequency.

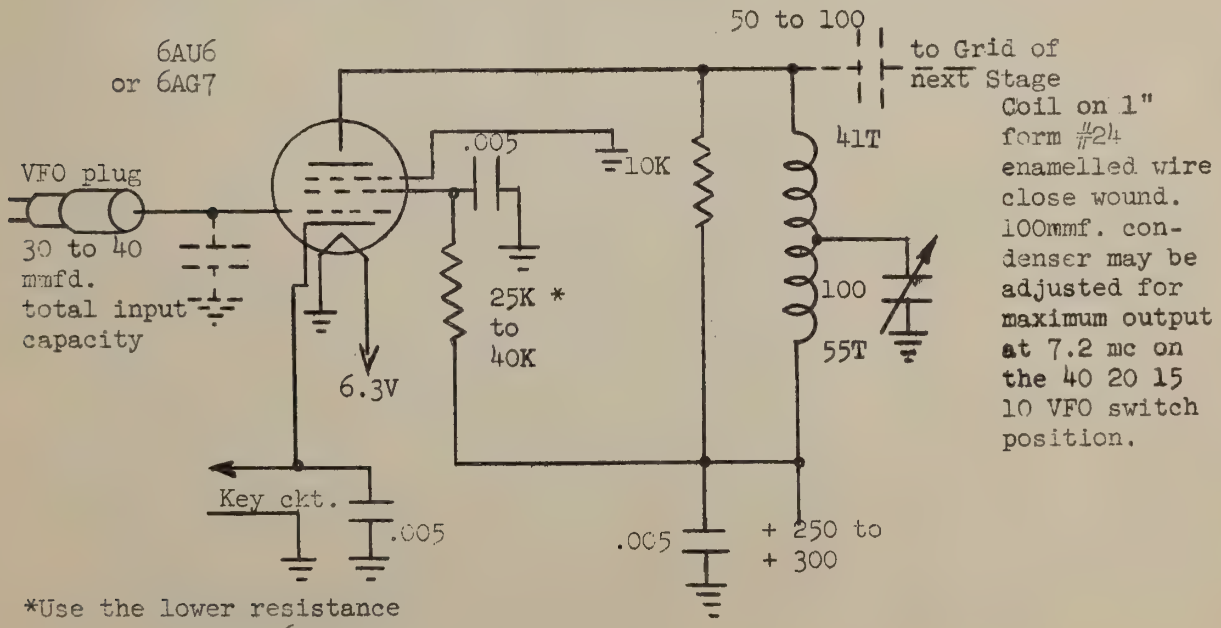
   d. Some triode oscillator and tri-tet oscillator stages will not provide sufficient isolation or sensitivity to be used directly with the VFO. A suggested transmitter crystal oscillator-amplifier circuit is shown on the next page. This circuit properly built will provide the first stage sensitivity and power output required for many transmitters.

      A 6AU6 tube will provide sufficient isolation, sensitivity, and an output of more than one watt on "straight through" operation and somewhat less as a frequency doubler if proper tank constants are provided. A 6AG7 tube may be used if more power output is required. A 6AG7 can be expected to provide two or three times as much power output as the 6AU6 as an amplifier or frequency doubler. Tubes with higher plate to grid capacity may give feedback troubles. Reasonable circuit layout and good separation of grid and plate circuit components in this stage is desirable. The 6AG7 power requirement is somewhat greater than that of the 6AU6.



*Use lower resistance values with 6AG7

3. e. If 25 to 30 volts of RF at the VFO frequency ranges will drive the transmitter, an amplifier stage can be added at the transmitter. The amplifier may be directly coupled to the transmitter input circuit. The circuit below will provide 25 to 50 volts across 10,000 ohms without adding tuning controls. The 6AG7 tube can be expected to have an output of 40 to 50 volts while the 6AU6 can be expected to have an output of 20 to 30 volts RF. The amplifier should be located near the input stage of the transmitter. No capacity should be added in the plate circuit of the amplifier other than the output capacity of the amplifier tube and the input grid of the tube being driven by the amplifier. A suggested circuit is shown below.



Coil on 1" form #24 enamelled wire close wound. 100mmf. condenser may be adjusted for maximum output at 7.2 mc on the 40 20 15 10 VFO switch position.

*Use the lower resistance values with the 6AG7

The power supply of the transmitter should be capable of supplying the power required by the tube (250 to 300 VDC at 13 ma, 6.3V at .3A for the 6AU6, and 250 to 300 VDC at 25 ma, 6.3V at .65A for the 6AG7).

f. The output circuit of the Viking Model 122 VFO has a D.C. resistance of 22,000 ohms. The output circuit of the VFO must be isolated from the transmitter input grid by a blocking condenser (100 mmf) unless the 22,000 ohm grid resistance is not too low for the input stage.

g. Undoubtedly many existing transmitters can be connected directly or readily adapted to the Viking Model 122 VFO without much effort. It is recommended that parts C1 and C3 of these instructions and the transmitter under consideration be studied before proceeding to connect the VFO to a transmitter. Temporary connections and trials should be made before changing or adding circuits. Permanent arrangements can be made after the transmitter circuits have been found to utilize the VFO as the user desires.

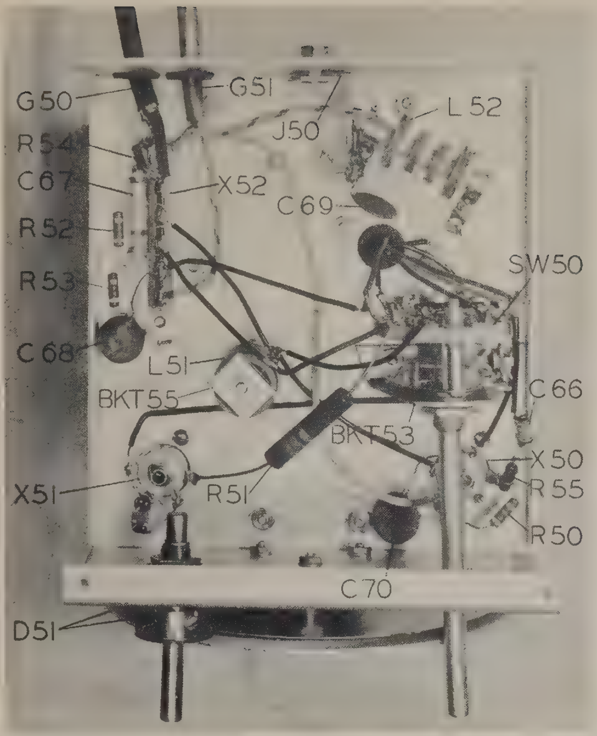


FIGURE 1a
CHASSIS BOTTOM

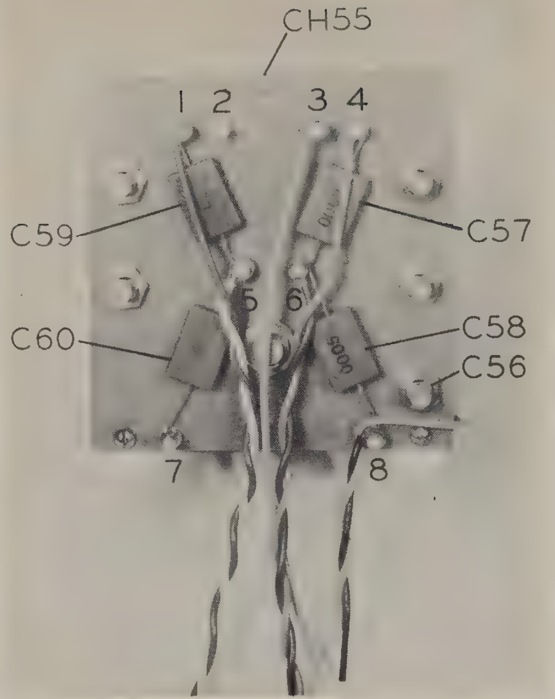


FIGURE 1b
REAR CONDENSER
TERMINAL BOARD

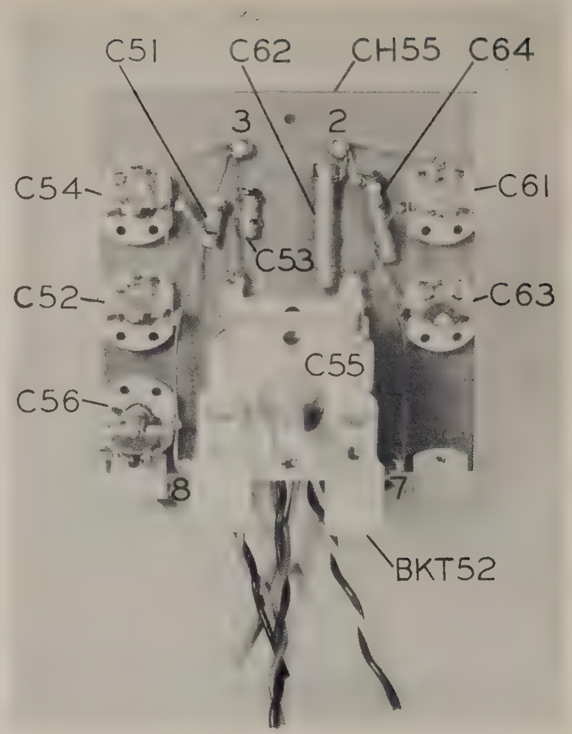


FIGURE 1c
FRONT CONDENSER
TERMINAL BOARD

PART D: PHOTOGRAPHS, CHARTS, AND SCHEMATIC DIAGRAMS

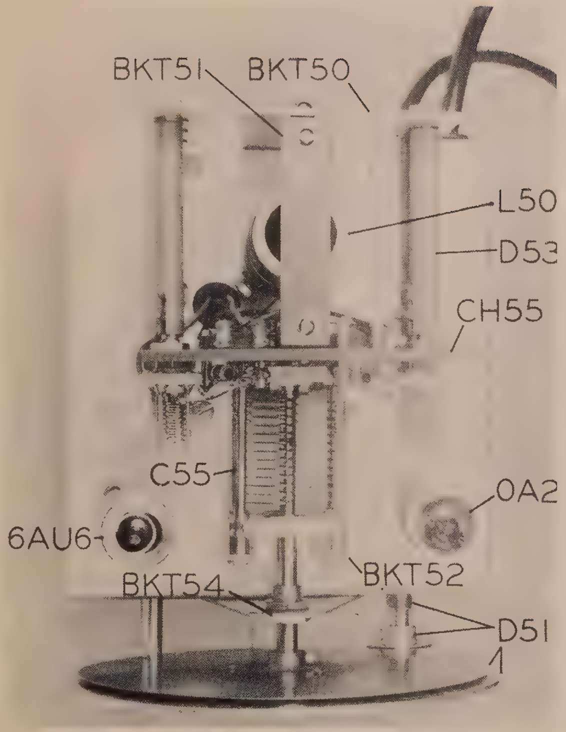


FIGURE 2a
CHASSIS TOP

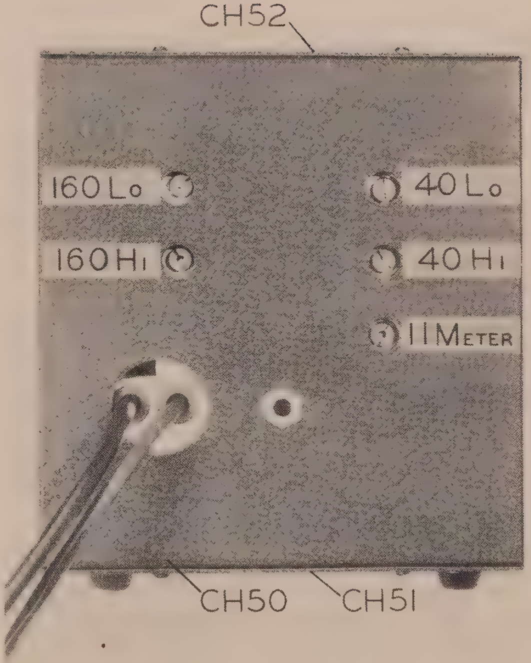


FIGURE 2b
CABINET BACK

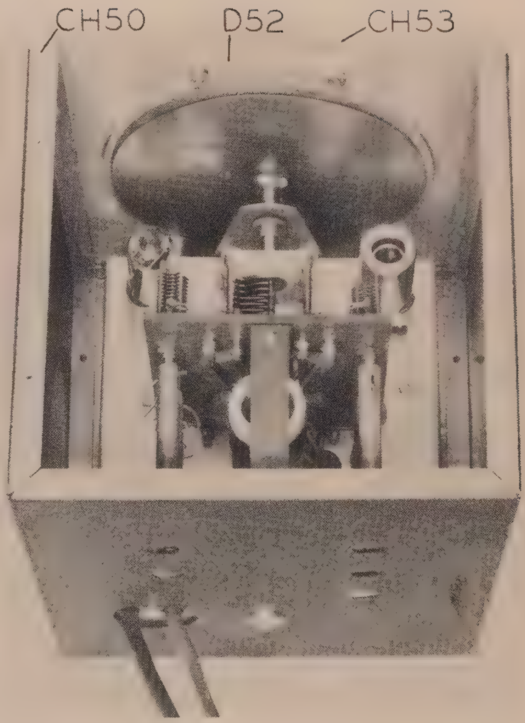
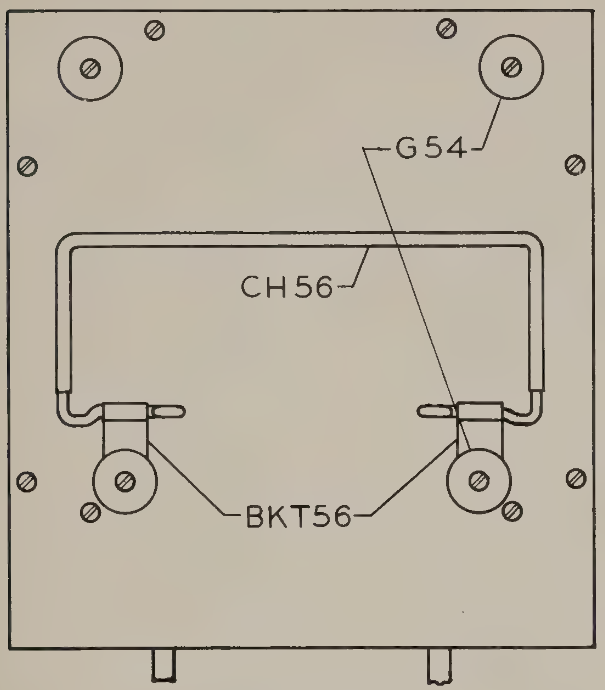


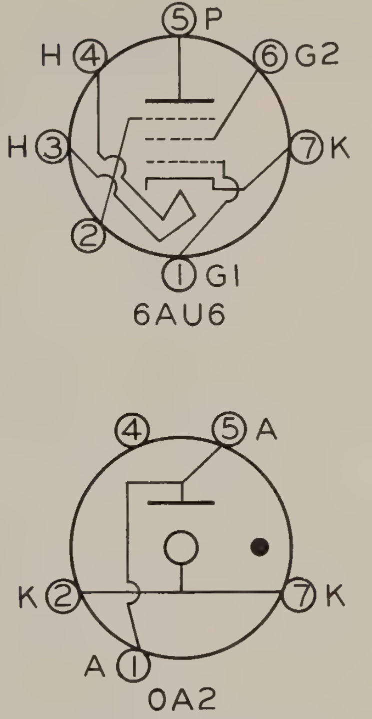
FIGURE 2c
CABINET TOP

FIGURE 3a



CABINET BOTTOM
AND TILT STAND

FIGURE 3b

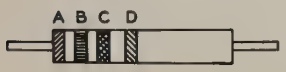


SOCKET CONNECTIONS
BOTTOM VIEW

	SIGNIF. FIGURE	DECIMAL MULTIP.	PERCENT TOLER.	TEMP. COEFF.	CHARAC-TERISTIC	VOLTAGE RATING
BLACK	0	1		NPO	A	
BROWN	1	10	1	N030	B	100
RED	2	100	2	N080	C	200
ORANGE	3	1000	3*	N150	D	300
YELLOW	4	10000	4	N220	E	400
GREEN	5		5	N330	F	500
BLUE	6		6	N470	G	600
VIOLET	7		7	N750		700
GRAY	8		8			800
WHITE	9		9#			900
NO COLOR			20			500

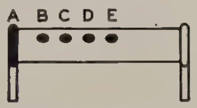
* #ON CERAMIC CONDENSERS; * IS 2.5%, # IS 10%

FIXED RESISTORS



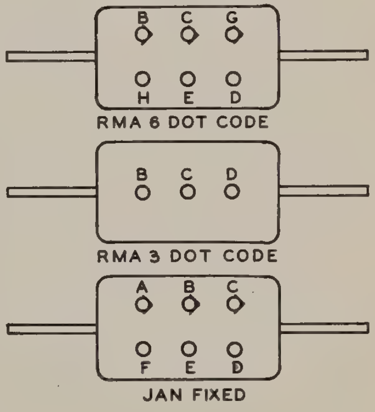
A-FIRST SIGNIF. FIGURE
B-SECOND SIGNIF. FIGURE
C-DECIMAL MULTIPLIER
D-TOLERANCE IN PERCENT
GOLD 5%
SILVER 10%
NO COLOR 20%

FIXED CERAMIC CAPACITORS



A-TEMPERATURE COEFF.
B-FIRST SIGNIF. FIGURE
C-SECOND SIGNIF. FIGURE
D-DECIMAL MULTIPLIER
E-TOLERANCE

FIXED CAPACITORS



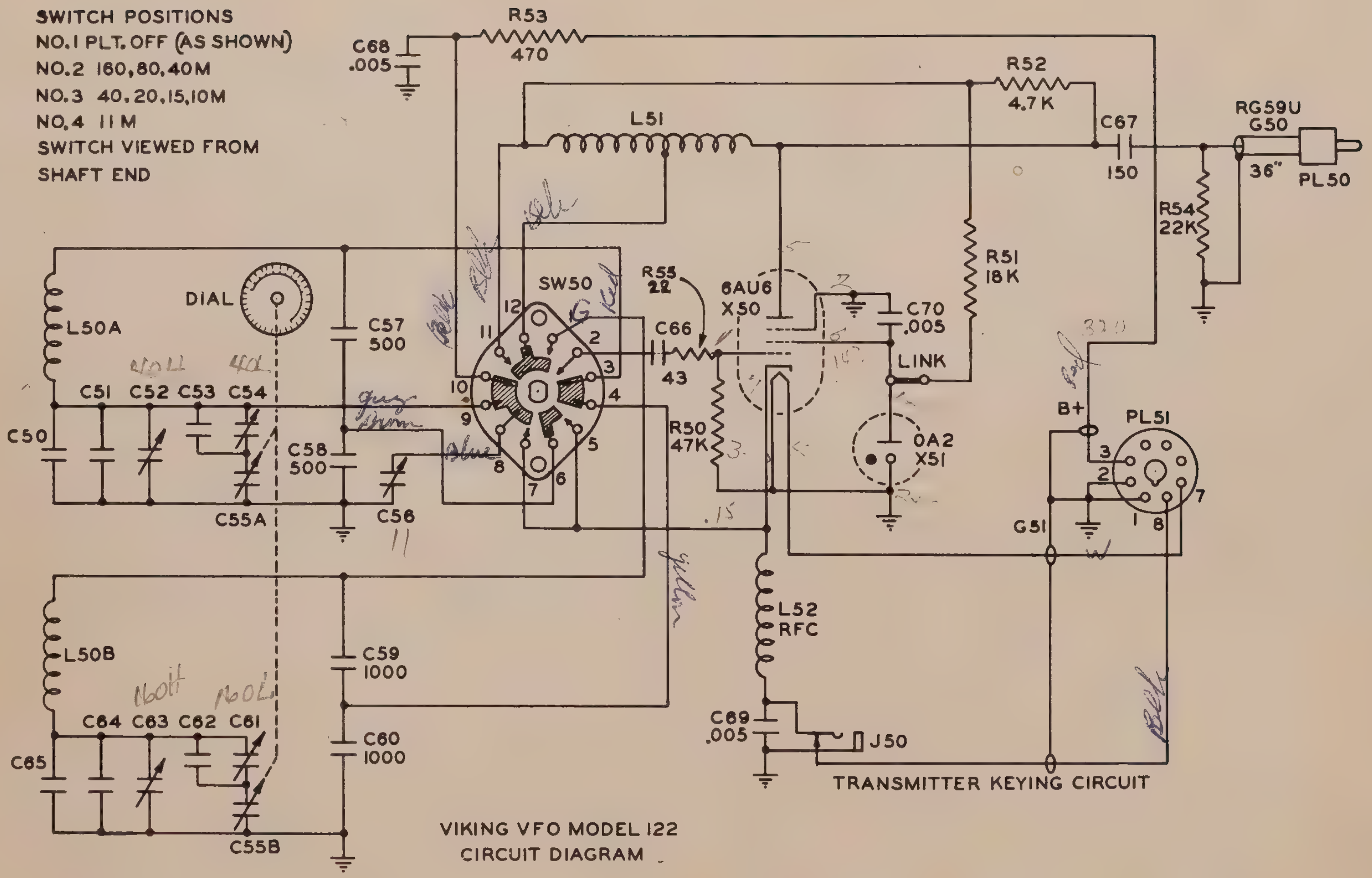
RMA 6 DOT CODE

RMA 3 DOT CODE

JAN FIXED

A-MICA BLACK PAPER SILVER
B-FIRST SIGNIF. FIGURE
C-SECOND SIGNIF. FIGURE
D-DECIMAL MULTIPLIER
E-TOLERANCE
F-CHARACTERISTIC
G-THIRD SIGNIF. FIGURE
H-VOLTAGE RATING

FIGURE 3c, RESISTOR-CONDENSER COLOR CODES



SWITCH POSITIONS
NO.1 PLT. OFF (AS SHOWN)
NO.2 160,80,40M
NO.3 40,20,15,10M
NO.4 11 M
SWITCH VIEWED FROM
SHAFT END

VIKING VFO MODEL 122
CIRCUIT DIAGRAM

FIGURE 4

E. VIKING VFO MODEL 122

Parts List

Part No. or Drawing No.	Item No.	Qty.	Description
17.789-1	CH50	1	Cabinet sides and back
17.790-1	CH51	1	Cabinet bottom
17.790-2	CH52	1	Cabinet top
17.791-3	CH53	1	Panel
17.788-1	CH54	1	Chassis
23.966-1	CH55	1	Condenser Mounting Board Assembly
23.979	CH56	1	Tilt Stand
16.1053-1	BKT50	1	Rear Trimmer Coupling Bracket
23.962	BKT51	1	Coil Support Bracket Assembly
16.25-1	BKT52	2	Condenser Mounting Bracket
16.857-4	BKT53	1	Switch Mounting Bracket
16.857-3	BKT54	1	Dial Mounting Bracket
16.120-7	BKT55	1	Output Coil Clamp piece (spacer)
16.1060	BKT56	2	Tilt Stand Bracket
13.123-7	D50	1	Panel Bearing (in 3/8" hardware env.)
23.969-1	D51	1	Dial Drive Assembly
23.971-1	D52	1	Escutcheon, Index Assembly
23.970-1	D53	5	Insulated Coupling Shaft Assembly
23.980-3	K52	2	Knob
22.113-1	G53	3	Rubber Grommet 9/16 OD
22.632-1	G54	4	Rubber Bumpers
71.91-100	W50	4 ft.	Black Plastic Covered #20 Copper Wire
71.91-105	W51	7 in.	Green Plastic Covered #20 Copper Wire
71.91-102	W52	7 in.	Red Plastic Covered #20 Copper Wire
71.91-104	W53	½ ft.	Yellow Plastic Covered #20 Copper Wire
71.91-101	W54	½ ft.	Brown Plastic Covered #20 Copper Wire
71.91-108	W55	½ ft.	Gray Plastic Covered #20 Copper Wire
71.91-106	W56	½ ft.	Blue Plastic Covered #20 Copper Wire
		1	#6 Hardware envelope
		1	#4 Hardware envelope
		1	3/8" Hardware and terminal envelope
22.794	SW50	1	VFO Bandswitch (4 Pos.)
23.968	L50	1	Dual Oscillator Coil Assembly
23.967	L51	1	Output Coil Assembly
102-750	L52	1	Radio Frequency Choke
22.224	J50	1	Mallory type A2A Transfer Jack
22.695	PL50A	1	PL259 Coaxial Plug
22.799	PL50B	1	UG176U Coaxial Adapter
71.32-178	G50	3 ft.	RG59U Coaxial Cable
71.32-202	G51	3½ ft.	Belden #8735 - 3 cond. Shielded Cable
22.800	PL51	1	Male Connector Amphenol 86-PM8
120-277-1	X50, X51	2	7 pin Miniature Sockets (Shielded)
22.740-5	X52	1	"2005" Jones Terminal Strip
133-278-7	S50	1	1 3/4" Miniature Tube Shield
22.717	R50	1	47,000 or 51,000 ohm ½ watt Resistor
22.802	R52	1	4,700 ohm ½ watt Resistor
22.801	R53	1	470 ohm ½ watt Resistor
22.716	R54	1	22,000 or 24,000 ohm ½ watt Resistor
22.713	R55	1	22 ohm ½ watt Resistor
160-104-24	C52	1	9M11 Var. Cond. (Rotor term. opposite side)
22.803	R51	1	18,000 ohm 2 watt Resistor

Part No. or Drawing No.	Item No.	Qty.	Description
160-107-24	C54	1	15M11 Var. Cond.(Rotor term. opposite side)
160-130-1	C61	1	30M8 Variable Condenser
160-107-1	C63, C56	2	15M11 Variable Condenser
169-17	C55	1	Special LA type Variable Condenser
22.804	C57, C58	2	500 mmfd. +2% Silver Mica Condenser
22.805	C59, C60	2	1000 mmfd. +2% Silver Mica Condenser
22.827	C68,C69,C70	3	.005 mfd 500 V.W. Bypass Condenser
22.806	C51	1	47 ± 2½% mmfd. N220 Ceramic Condenser
22.807	C53, C66	2	43 ± 2½% mmfd. NPO Ceramic Condenser
22.808	C67	1	150 ± 2½% mmfd. NPO Ceramic Condenser
22.809	C64	1	91 ± 2½% mmfd. N080 Ceramic Condenser
22.810	C50, C65	2	6.8 ± 0.5 mmfd NPO Ceramic Condenser
22.823	C62	1	140 ± 2½% mmfd NPO Ceramic Condenser

STANDARD WARRANTY

Adopted and Recommended by the
Radio - Electronics - Television Manufacturers Association

The E. F. Johnson Company warrants each new radio product manufactured by it to be free from defective material and workmanship and agrees to remedy any such defect or to furnish a new part, except for electron tubes, in exchange for any part of any unit of its manufacture which under normal installation, use and service disclosed such defect, provided the unit is delivered by the owner to us or to our authorized radio dealer or wholesaler from whom purchased, intact, for our examination, with all transportation charges prepaid to our factory, within ninety days from the date of sale to original purchaser and provided that such examination disclosed in our judgement that it is thus defective.

This warranty does not extend to any of our radio products which have been subjected to misuse, neglect, accident, incorrect wiring not our own, improper installation, or to use in violation of instructions furnished by us, nor extend to units which have been repaired or altered outside of our factory, nor to cases where the serial number thereof has been removed, defaced or changed, nor tc accessories used therewith not of our own manufacture, nor to electron tubes.

Defective electron tubes should be returned directly to the tube manufacturer for adjustment at the following addresses:

(a) For RCA tubes to: Adjustment Service, RCA at the nearest of the following addresses:

34 Exchange Place
Jersey City 2, N. J.

589 East Illinois Street
Chicago 11, Illinois

420 So. San Pedro Street
Los Angeles 13, California

(b) For General Electric tubes to:

Adjustment Service, Owensboro Tube Works
General Electric Company
Owensboro, Kentucky

Any part of a unit approved for remedy or exchange hereunder will be remedied or exchanged by the authorized radio dealer or wholesaler without charge to the owner.

This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to assume for us any other liability in connection with the sale of our radio products.

REPRESENTATIVES:

Atlanta 5, Ga., James Millar Associates, 1036 Peachtree St., N. E., ELgin 0919

Boston 6, Mass., Paul R. Sturgeon, 25 Huntington Ave., COpley 7-2562

Chicago 31, Ill., Ellinger Sales Co., 6540 Northwest Highway, ROdney 3-1570

Columbus 15, Ohio, Wm. E. McFadden, 150 East Broad St., MAin 3363

Denver 3, Colo., Ronald G. Bowen, 825 Broadway, Rooms 307-309, AComa 5211

Highland Park 3, Mich., A.B.M. Sales Company, 15850 Third Ave.,
TOwnsend 8-0044

Kansas City 8, Mo., Herbert A. Roes & Co., 2601 Cherry St., HArrison 2036

Los Angeles 15, Calif., Don C. & Wm. H. Wallace, 1206 Maple Ave.,
Bendix Building, RIchmond 7-0401

Minneapolis 1, Minn., Fred B. Hill Co., 256 1st Ave. No., MAin 8353

New York 16, N. Y., F. Edwin Schmitt Co., 136 Liberty St., WOrth 2-6550

Philadelphia 2, Pa., S. K. MacDonald, Inc., 1531 Spruce St., KIngsley 5-1205

Phoenix, Ariz., Harry A. Moore Sales Co., 4142 North 18th St., AMherst 5-4662

Pittsburgh 22, Pa., S. K. MacDonald Inc., 715 State Theatre Building,
335 Fifth Ave., ATlantic 1-2253

Portland 10, Ore., Dave M. Lee Co., 2712 N. W. Raleigh St., BEacon 2241

San Francisco, Calif., Logan Sales Co., 530 Gough St., HEmlock 1-5127

Seattle 1, Wash., Dave M. Lee Co., 2517 Second Ave., MAin 5512

Syracuse 4, N. Y., Wally B. Swank, 2310 Bellevue Avenue, 76-8056

Washington, D. C., S. K. MacDonald Inc., 217 Riggs Bank Building,
3308 14th St., N. W., COlumbia 3938

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Cable Address—Simontrice

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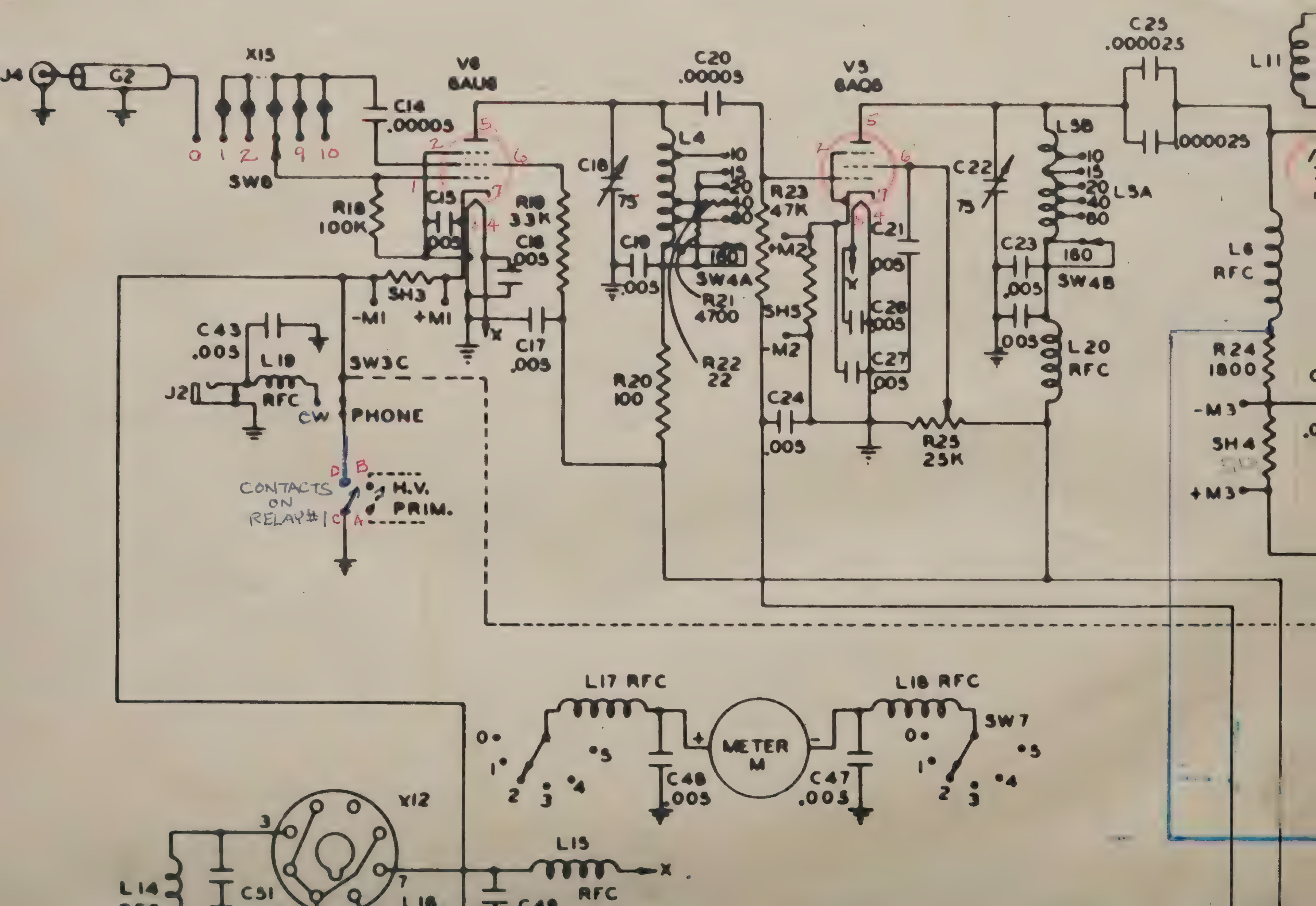
J4
G2
X15
0 1 2 9 10
SW8
C14
.00005
V6
6AU6
R18
100K
C15
.005
R19
33K
C16
.005
SH3
-M1
+M1
X
C17
.005
C43
.005
L19
RFC
J2
CW
PHONE
SW3C
D B
CONTACTS ON RELAY#1
C A
H.V.
PRIM.
C20
.00005
C18
75
L4
10
15
20
40
80
160
C19
.005
SW4A
R21
4700
R22
22
R20
100
R23
47K
+M2
SH5
-M2
V5
6AQ5
C21
.005
C26
.005
C27
.005
C24
.005
R25
25K
C22
75
L5B
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20
40
80
L5A
C23
.005
160
SW4B
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L20
RFC
C25
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L11
L6
RFC
R24
1800
-M3
SH4
+M3
L17 RFC
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C48
.005
C47
.005
L18 RFC
SW7
0 1 2 3 4 5
0 1 2 3 4 5
X12
3
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L14
C51
L15
RFC
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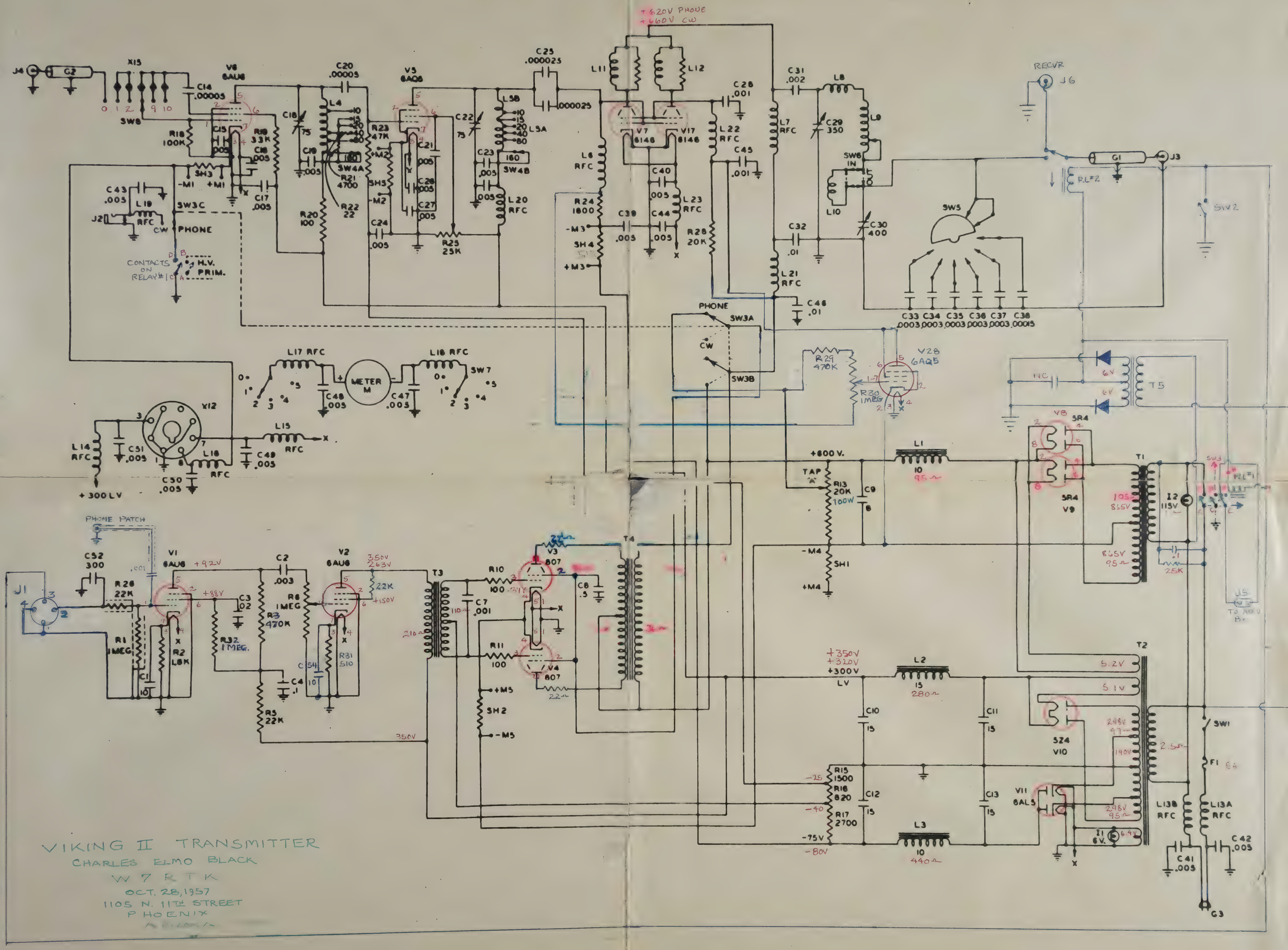
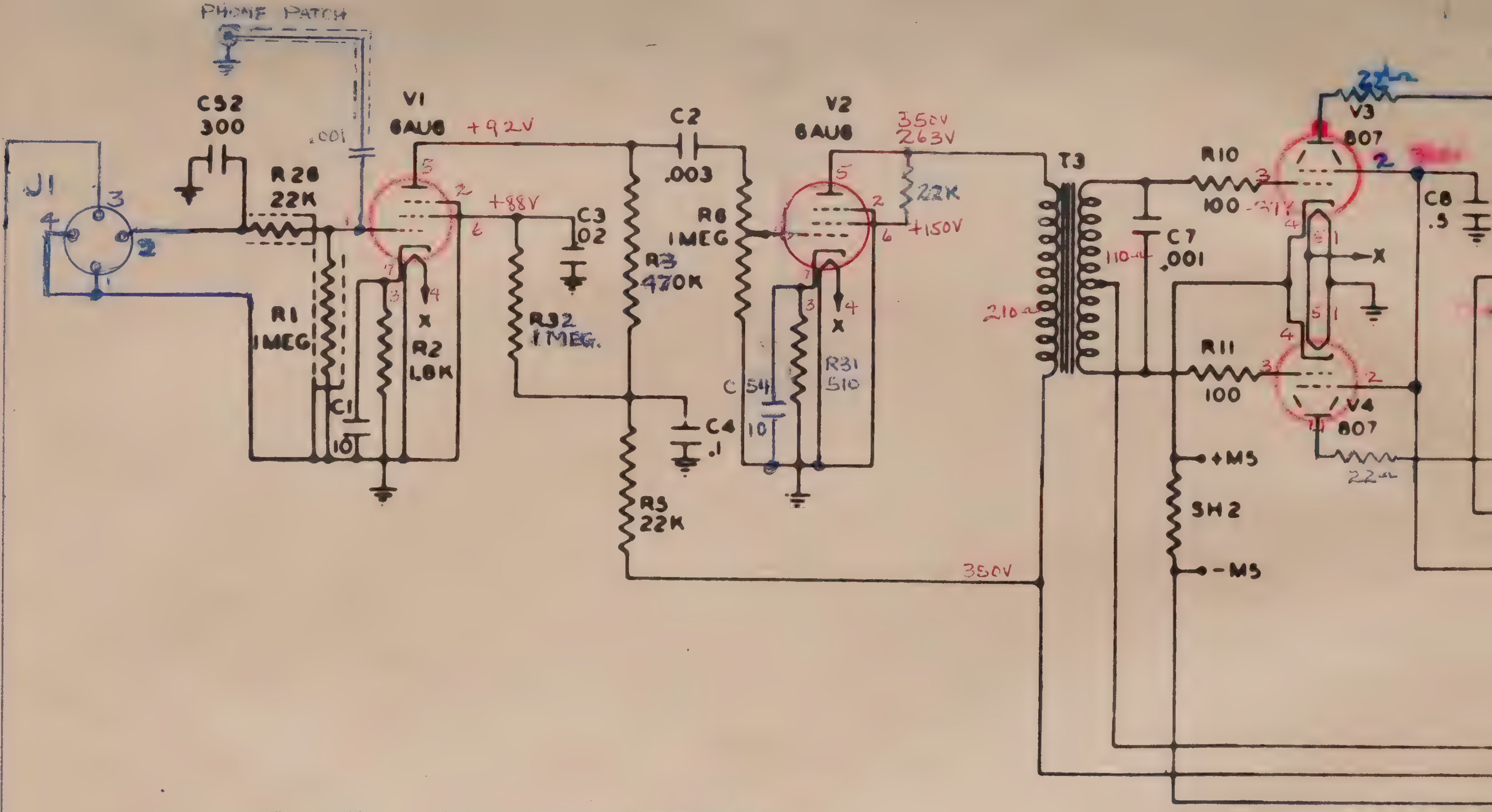


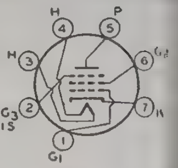
VIKING II TRANSMITTER
CHARLES ELMO BLACK
W 7 R T K
OCT. 28, 1957
1105 N. 11TH STREET
PHOENIX
ARIZONA



VIKING II TRANSMITTER
CHARLES ELMO BLACK
W7RTK
OCT 28, 1957
1105 N. 11TH STREET
PHOENIX
ARIZONA

SHARP-CUTOFF PENTODE

6AU6



Miniature type used in compact radio equipment as an rf amplifier especially in high-frequency, wide-band applications. It is also used as a limiter tube in FM equipment. Outline 10, OUTLINES SECTION. Tube requires miniature seven-contact socket and may be mounted in any position. For a discussion of limiters, refer to ELECTRON TUBE APPLICATIONS SECTION. For typical operation as resistance-coupled amplifier, refer to Chart 8, RESISTANCE-COUPLED AMPLIFIER SECTION. For heater and cathode considerations, refer to type 6AT6.

HEATER VOLTAGE (AC/DC)	6.3	volts
HEATER CURRENT	0.3	amperes
DIRECT INTERELECTRODE CAPACITANCES (No external shield):		
Grid No.1 to Plate	0.0035 *max*	μμf
Input	5.5	μμf
Output	5.0	μμf

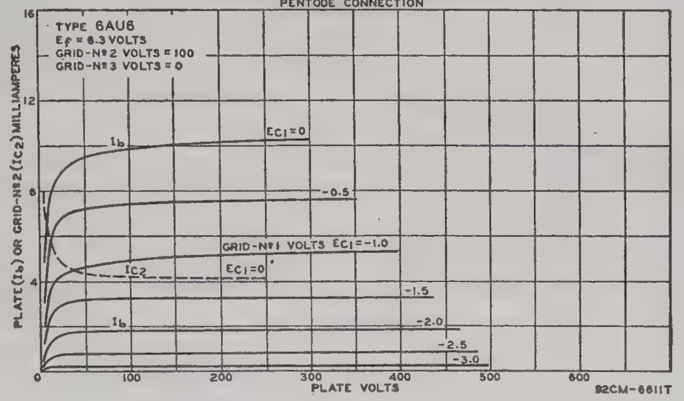
Maximum Ratings: CLASS A₁ AMPLIFIER	*Triode† Connection*	*Pentode Connection*	
PLATE VOLTAGE	250 *max*	300 *max*	volts
GRID-No.2 (SCREEN) VOLTAGE	–	150 *max*	volts
GRID-No.2 SUPPLY VOLTAGE	–	300 *max*	volts
PLATE DISSIPATION	3.2 *max*	3 *max*	watts
GRID-No.2 DISSIPATION	–	0.65 *max*	watts
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Negative bias value	50 *max*	50 *max*	volts
Positive bias value	0 *max*	0 *max*	volts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	90 *max*	90 *max*	volts
Heater positive with respect to cathode	90 *max*	90 *max*	volts

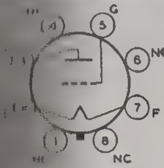
Typical Operation (Pentode Connection):				
Plate Voltage	100	250	250	volts
Grid No.3 (Suppressor)	Connected to cathode at socket			
Grid-No.2 Voltage	100	125	150	volts
Grid-No.1 Voltage	–1	–1	–1	volt
Plate Resistance (Approx.)	0.5	1.5	1.0	megohms
Transconductance	3900	4450	5200	μmhos
Grid-No.1 Bias for plate current of 10 μa.	–4.2	–5.2	–6.2	volts
Plate Current	5.2	7.6	10.8	ma
Grid-No. 2 Current	2.0	3.0	4.3	ma

Typical Operation (Triode Connection):†		
Plate Voltage	250	volts
Grid Voltage	–4	volts
Amplification Factor	36	
Plate Resistance	7500	ohms
Transconductance	4800	μmhos
Plate Current	12.2	ma

† Grid No. 2 and grid No. 3 tied to plate.

AVERAGE PLATE CHARACTERISTICS
PENTODE CONNECTION

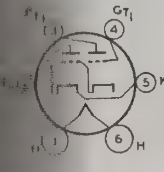




POWER TRIODE

6B4-G

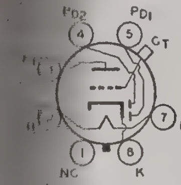
Glass octal type used in output stage of radio receivers. Outline 33, OUTLINES SECTION. Tube requires octal socket. Except for filament rating (6.3 volts ac/dc; 1.0 ampere) and slightly lower power output, this type is identical electrically with type 2A3.



DIRECT-COUPLED POWER TRIODE

6B5

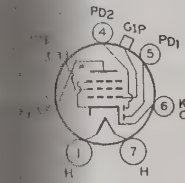
Glass type used as class A₁ power amplifier. One triode, the driver, is directly connected within the tube to the second, or output, triode. Outline 29, OUTLINES SECTION. Tube requires six-contact socket. Heater volts (ac/dc), 6.3; amperes, 0.8. Characteristics of input and output triodes as class A₁ amplifier follow. Input triode: plate volts, 300 *max*; grid volts, 0; plate [illegible] Output triode: plate volts, 300 *max*; plate ma., 45; plate resistance, 24000 ohms; load resistance [illegible] ohms; output watts, 4. This type is used principally for renewal purposes.



TWIN-DIODE—HIGH-MU TRIODE

6B6-G

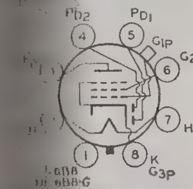
Glass octal type used as combined detector, amplifier, and avc tube. Outline 26, OUTLINES SECTION. Tube requires octal socket. Heater volts (ac/dc), 6.3; amperes, 0.3. Within its triode maximum plate-voltage rating, this type is similar electrically to type 6SQ7 and curves under that type apply to the 6B6-G. This type is used principally for renewal purposes.



TWIN-DIODE—
REMOTE-CUTOFF PENTODE

6B7
6B7S

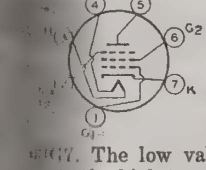
Glass types used as combined detector, amplifier, and avc tubes. Outline 27, OUTLINES SECTION. These types fit the small seven-contact (0.75-inch, pin-circle diameter) socket. Except for interelectrode capacitances, the electrical characteristics of the 6B7 are identical with those of type 6B8-G. Type 6B7 is used principally for renewal purposes. Type 6B7S, [illegible] DISCONTINUED, has an external shield connected to the cathode. In general, its electric characteristics are similar to those of the 6B7, but the two types are usually not directly interchangeabl



TWIN-DIODE—
REMOTE-CUTOFF PENTODE

6B8
6B8-G

Metal type 6B8 and glass octal type 6B8-G are used as combined detector, amplifier, and avc tubes. Outlines 4 and 26, respectively, OUTLINES SECTION. Tubes require octal socket. Type 6B8-G requires complete shielding of detector circuits. Heater volts (ac/dc), 6.3; amperes, 0.3. Maximum ratings of pentode unit as class A₁ amplifier: plate volts, 300 *max*; grid-No.2 (screen) volts, 125 *max*; grid-No.2 suppl [illegible] 300 *max*; grid-No.1 volts, 0 *min*; plate dissipation, 3.0 *max* watts (6B8), 2.25 *max* watts (6B8-G grid No. 2 dissipation, 0.3 *max* watt. For typical operation as a resistance-coupled amplifier, refer [illegible] 5, RESISTANCE-COUPLED AMPLIFIER SECTION.



REMOTE-CUTOFF PENTODE

6BA6

Miniature type used as rf amplifier in standard broadcast and FM receivers, as well as in wide-band, high-frequency applications. This type is similar in performance to metal type [illegible]. The low value of grid-plate capacitance minimizes regenerative effect [illegible] the high transconductance makes possible high signal-to-noise ratio.

6AN8A

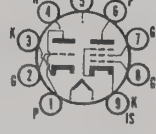
5AN8

Color Television Type

OSC./SYNC SEP./SYNC CLIPPER (T) IF/VIDEO/AGC AMPLIFIER (P)

Medium Mu Triode and Sharp Cutoff Pentode

Construction	Miniature T-6½
Base	Button 9 Pin, E9-1
Basing	9DA
Outline	6-2
Maximum Diameter	0.875 In.
Maximum Seated Height	1.938 In.
Maximum Overall Height	2.188 In.



9DA

ELECTRICAL DATA
HEATER OPERATION

	5AN8 Series	6AN8A Series
Heater Voltage	4.7	6.3 Volts
Heater Current	600	450 Ma
Heater Warm-up Time	11	11 Seconds
Maximum Heater-Cathode Voltage		
Heater Negative With Respect to Cathode		
Total DC and Peak		200 Volts
Heater Positive With Respect to Cathode		
DC		100 Volts
Total DC and Peak		200 Volts

DIRECT INTERELECTRODE CAPACITANCES

Triode Section	
Grid to Plate	1.5 Pf
Input: gto (h + k)	2.0 Pf
Output: p to (h + k)	0.26 Pf
Pentode Section	
Grid No. 1 to Plate (Max.)	0.04 Pf
Input: g1 to (h + k + g2 + g3 + IS)	7.0 Pf
Output: p to (h + k + g2 + g3 + IS)	2.4 Pf
Coupling	
Triode Grid to Pentode Plate (Max.)	0.02 Pf
Pentode Grid No. 1 to Triode Plate (Max.)	0.02 Pf
Pentode Plate to Triode Plate (Max.)	0.15 Pf

RATINGS (Design Maximum Rating System)

	Triode Section	Pentode Section
Plate Voltage (Max.)	330	330 Volts
Grid No. 2 Supply Voltage (Max.)	—	330 Volts
Grid No. 2 Voltage	See Rating Chart (Gen. Info. Sec.)	
Grid No. 1 Voltage		
Positive Bias Value (Max.)	0	0 Volt
Plate Dissipation (Max.)	2.8	2.3 Watts
Grid No. 2 Input (Max.)	—	0.55 Watt
Grid No. 1 Circuit Resistance(1)		
Fixed Bias (Max.)	0.5	0.25 Megohm
Cathode Bias (Max.)	1.0	1.0 Megohm

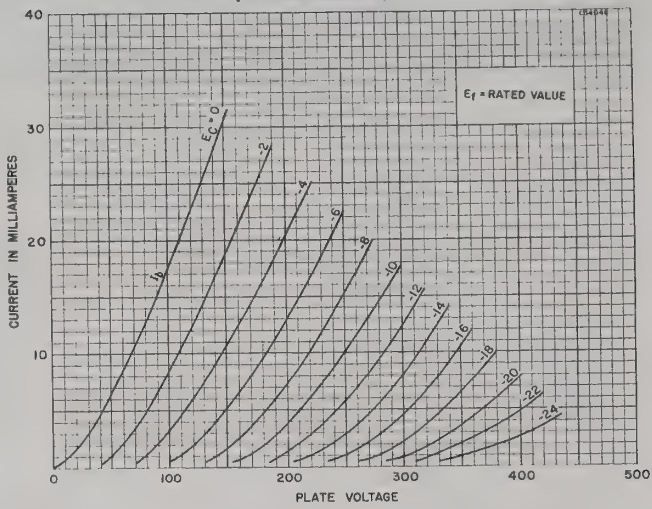
CHARACTERISTICS AND TYPICAL OPERATION

	Triode Section	Pentode Section
Plate Supply Voltage	150	125 Volts
Grid No. 2 Supply Voltage	—	125 Volts
Grid No. 1 Voltage	-3	— Volts
Cathode Bias Resistor	—	56 Ohms
Plate Current	15	12 Ma
Grid No. 2 Current	—	3.8 Ma
Transconductance	4500	7800 μmhos
Amplification Factor	21	—
Plate Resistance (Approx.)	4700	170,000 Ohms
Ec1 for Ib = 20μa (Approx.)	-17	-6 Volts
Ib with Ec1 = -3 Volts, Rk = 0	—	1.6 Ma

NOTE:

(1) If either section is operating at maximum rated conditions, the Grid No. 1 circuit resistance for both sections should not exceed the stated values.

AVERAGE PLATE CHARACTERISTICS
(Triode Section)



Color Television Type

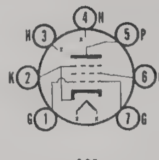
AUDIO POWER AMPLIFIER or VERTICAL DEFLECTION AMP.

6AQ5A

5AQ5, 12AQ5, 19AQ5

Beam Power Pentode

Construction	Miniature T-5½
Base	Button 7 Pin, E7-1
Basing	7BZ
Outline	5-3
Maximum Diameter	0.750 In.
Maximum Seated Height	2.375 In.
Maximum Overall Height	2.625 In.



7BZ

ELECTRICAL DATA
HEATER OPERATION

	19AQ5	12AQ5	5AQ5	6AQ5A
Heater Voltage	18.9	12.6	4.7	6.3 Volts
Heater Current	150	225	600	450 Ma
Heater Warm-up Time	—	—	11	11 Seconds
Maximum Heater-Cathode Voltage				
Heater Negative with Respect to Cathode				
Total DC and Peak				200 Volts
Heater Positive with Respect to Cathode				
DC				100 Volts
Total DC and Peak				200 Volts

DIRECT INTERELECTRODE CAPACITANCES

Grid to Plate	0.4 Pf
Input: g1 to (h + k + g2 + g3)	8.0 Pf
Output: p to (h + k + g2 + g3)	8.5 Pf

RATINGS (Design Maximum Rating System)

Class A1 Amplifier	
Plate Voltage (Max.)	275 Volts
Grid No. 2 Voltage (Max.)	275 Volts
Plate Dissipation (Max.)	12 Watts
Grid No. 2 Dissipation (Max.)	2 Watts
Grid No. 1 Circuit Resistance	
Fixed Bias (Max.)	0.1 Megohm
Cathode Bias (Max.)	0.5 Megohm
Bulb Temperature (At Any Point) (Max.)	260 °C

Vertical Deflection Amplifier[1]—Triode Connected[2]

Plate Voltage (Max.)	275 Volts
Peak Positive Plate Voltage (Abs. Max.)	1100 Volts
Plate Dissipation (Max.)[3]	10 Watts
Peak Negative Grid No. 1 Voltage (Max.)	275 Volts
Average Cathode Current (Max.)	40 Ma
Peak Cathode Current (Max.)	115 Ma
Grid No. 1 Circuit Resistance Cathode Bias (Max.)	2.2 Megohms

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier	Triode Conn.	Pentode Conn.	
Plate Voltage	250	180	250 Volts
Grid No. 2 Voltage	—	180	250 Volts
Grid No. 1 Voltage	–12.5	–8.5	–12.5 Volts
Peak AF Grid No. 1 Voltage	—	8.5	12.5 Volts
Zero-Signal Plate Current	49.5	29	45 Ma
Maximum Signal Plate Current	—	30	47 Ma
Zero-Signal Grid No. 2 Current	—	3	4.5 Ma
Maximum Signal Grid No. 2 Current	—	4	7.0 Ma
Plate Resistance (Approx.)	1970	58,000	52,000 Ohms
Transconductance	4800	3700	4100 μmhos
Load Resistance	—	5500	5000 Ohms
Maximum Signal Power Output	—	2.0	4.5 Watts
Total Harmonic Distortion (Approx.)	—	8	8 Percent
Ec1 for Ib = 0.5 Ma (Approx.)	–37	—	— Volts

NOTES:

(1) For operation in a 525 line, 30 frame system as described in ''Standards of Good Engineering Practice for Television Broadcast Stations; Federal Communications Commission,'' the duty cycle of the voltage pulse must not exceed 15% of one horizontal scanning cycle.

(2) Grid No. 2 connected to plate.

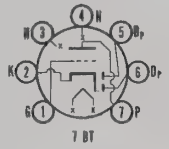
(3) In stages operating with grid leak bias, an adequate cathode bias resistor or other suitable means is required to protect the tube in the absence of excitation.

6AQ6

AF AMPLIFIER AND DETECTOR

Double Diode and High Mu Triode

Construction	Miniature T-5½
Base	Button 7 Pin, E7-1
Basing	7BT
Outline	5-2
Maximum Diameter	0.750 In.
Maximum Seated Height	1.875 In.
Maximum Overall Height	2.125 In.



ELECTRICAL DATA

HEATER OPERATION

Heater Voltage	6.3 Volts
Heater Current	150 Ma
Maximum Heater Cathode Voltage	90 Volts

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[1]

Grid to Plate	1.8 Pf
Input	1.7 Pf
Output	1.5 Pf

RATINGS (Design Center Rating System)

Triode

Plate Voltage (Max.)	300 Volts
Positive Grid No. 1 Voltage (Max.)	0 Volt

Diode

Diode Operating Current Per Plate (Max.)	0.9 Ma

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier		
Plate Voltage	100	250 Volts
Grid No. 1 Voltage[2]	–1	–3 Volts
Plate Resistance (Approx.)	61,000	58,000 Ohms
Transconductance	1150	1200 μmhos
Plate Current	0.8	1.0 Ma

NOTES:

(1) Shield No. 316 connected to cathode.

(2) Diode biasing of the triode section is not recommended.

Color Television Type

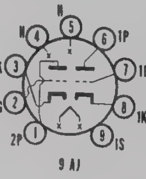
RF AMPLIFIER AND MIXER

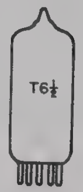
6AQ8/ECC85

9AQ8

High Mu Twin Triode

Construction	Miniature T-6½
Base	Button 9 Pin, E9-1
Basing[1,2]	9AJ
Outline	6-2
Maximum Diameter	0.875 In.
Maximum Seated Height	1.937 In.
Maximum Overall Height	2.187 In.





ELECTRICAL DATA

HEATER OPERATION

	9AQ8	6AQ8/ECC85
Heater Voltage	9.0	6.3 Volts
Heater Current	300	435 Ma
Maximum Heater-Cathode Voltage	90	90 Volts

DIRECT INTERELECTRODE CAPACITANCES

	Section No. 1	Section No. 2
Grid to Plate	1.5	1.5 Pf
Input: g to (k + h + IS)	3.0	3.0 Pf
Output: p to (k + h + IS)	1.2	1.2 Pf

RATINGS (Design Center Rating System) (Each Section)

Plate Voltage (Max.)	300 Volts
Plate Dissipation (Max.)	2.5 Watts
Cathode Current (Max.)	15 Ma
Negative Grid Voltage (Max.)	100 Volts
Grid Circuit Resistance (Max.)	1.0 Megohms

CHARACTERISTICS AND TYPICAL OPERATION

	R-F Amp		Autodyne Osc/Mixer
Plate Supply Voltage	—	250	250 Volts
Plate Dropping Resistor	—	1800	12,000 Ohms
Plate Voltage	250	230	— Volts
Grid Voltage	–2.3	–2.0	— Volts
Cathode Resistor	—	200	— Ohms
Grid Leak Resistor	—	—	1.0 Megohms
Oscillator Voltage (RMS)	—	—	3 Volts
Plate Current	10	10	5.2 Ma
Transconductance	5900	6000	— μmhos
Conversion Transconductance	—	—	2300 μmhos
Amplification Factor	57	—	—
Plate Resistance	—	9700	22,000 Ohms
Input Resistance at 100 MHz	—	6000	15,000 Ohms
Equivalent Noise Resistance	—	500	— Ohms

NOTES:

(1) Section No. 1 connects to Pins 6, 7, and 8.

(2) An internal shield is connected to Pin No. 9 to provide isolation between the two sections.

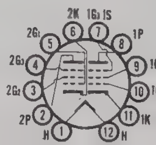
IF AMPLIFIER

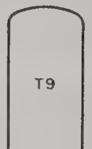
6AR11

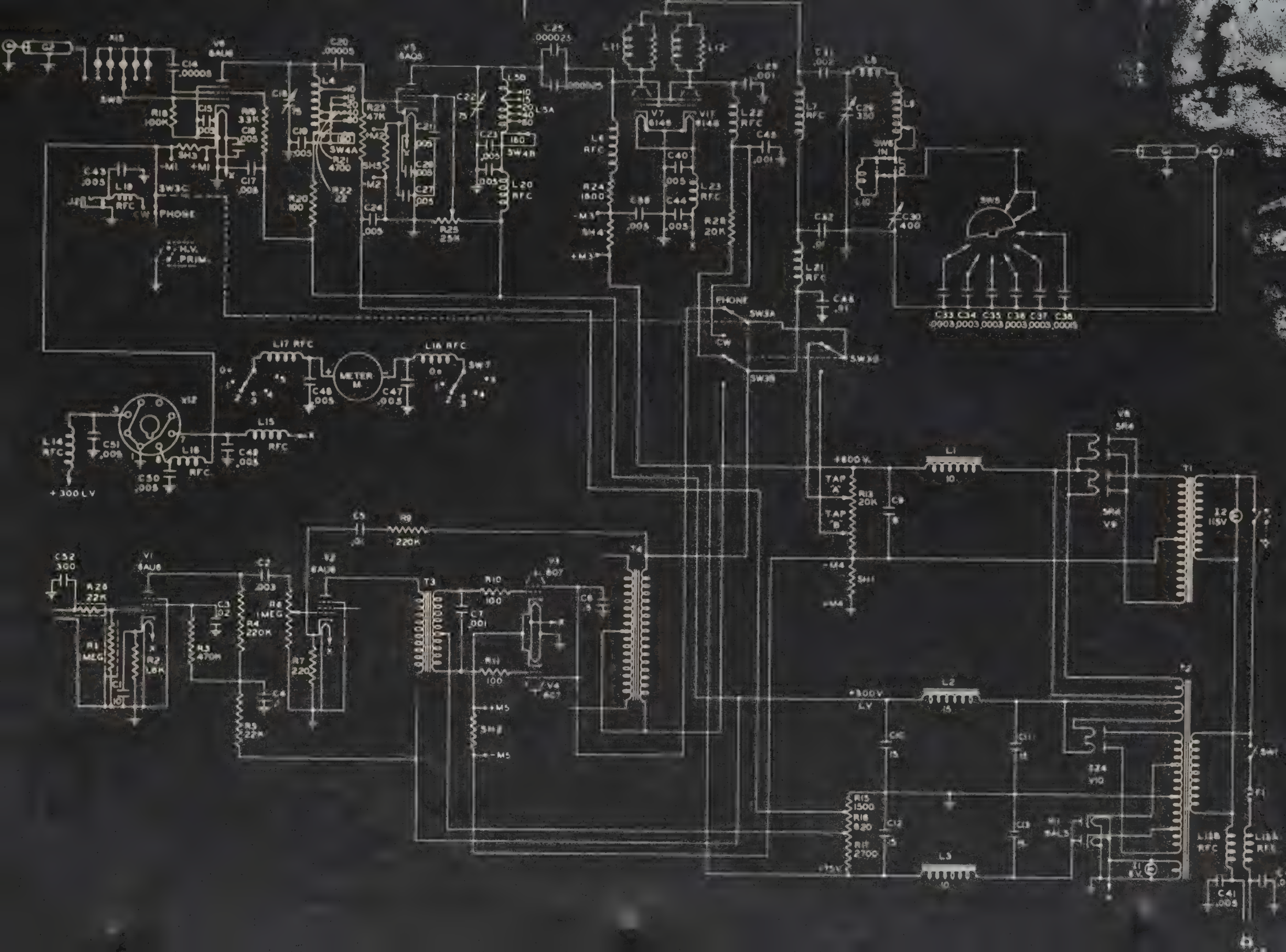
8AR11, 11AR11

Twin Pentode

Construction	Compactron T-9
Base	Button 12 Pin, E12-70
Basing	12DM
Outline	9-58
Maximum Diameter	1.188 In.
Maximum Seated Height	2.000 In.
Maximum Overall Height	2.375 In.






C3
R15
SW8
V6 6AU6
C14 .00005
R18 100K
C15
R19 33K
C8 .005
SH3
-M1
+M1
C17 .005
C43 .005
L19 RFC
J2
SW3C
CW
PHONE
H.V. PRIM.
C20 .00005
C18 75
L4
C19 .005
SW4A
R21 4700
R22 22
R20 100
V5 6AQ5
R23 47K
M2
SH5
-M2
C24 .005
C21 .005
C26 .005
C27 .005
R25 25K
C22 75
L5B
L5A
C23 .005
180
SW4B
L20 RFC
C25 .000025
.000025
L11
L12
V7 6146
V11 6146
L6 RFC
R24 1800
-M3
SH4
+M3
C38 .005
C40 .005
C44 .005
L23 RFC
R28 20K
L29 .001
L22 RFC
C48 .001
L7 RFC
C31 .002
L8
C29 350
L9
SW6 IN
L10
C30 400
C32 .01
L21 RFC
C46 .01
SW5
C33 C34 C35 C36 C37 C38
.0003 .0003 .0003 .0003 .0003 .0005
J1
PHONE
SW3A
CW
SW3B
SW3D
L17 RFC
METER M
C48 .005
L16 RFC
C47 .005
SW7
X12
L14 RFC
C51 .005
L18 RFC
C50 .005
L15 RFC
C49 .005
+300 L.V
C5 .01
R9 220K
C52 300
V1 6AU6
R26 22K
R1 1MEG
R2 1.8K
C1 10
R3 470K
C3 .02
C2 .003
R4 220K
R5 22K
C4
R6 1MEG
V2 6AU6
R7 220
T3
C7 .001
R10 100
R11 100
V3 807
V4 807
C6
+M5
SH2
-M5
T4
+600 V.
L1 10
TAP A
TAP B
R13 20K
C9 8
-M4
SH1
+M4
V8 5R4
V9 5R4
T1
I2 115V
+300V L.V
L2 15
C10 15
C11 15
T2
X24 V10
R15 1500
R16 820
R17 2700
C12 15
C13 15
-75V
L3 10
V11 6AL5
I1 6V
L13B RFC
L13A RFC
C41 .005
SW1
F1

INTRODUCTION TO

THE ASSEMBLY DETAILS FOR THE

JOHNSON VIKING II TRANSMITTER KIT

Success in assembling a piece of radio equipment, such as the Viking II, requires only that the instructions be followed implicitly, and that the work be divided into sections which may be easily checked for correctness and completeness. It is a good plan to read over each description of the operation, perform it, and using the schematic diagram, check to see if your interpretation agrees with the schematic. As you go along you will be surprised how very familiar with the transmitter you become. Even with this, it is inevitable that some small mistakes will be made; however, by the time the transmitter is finished, these mistakes can be found readily by following the test procedure.

Avoid "rosin" or "cold" solder connections by using a clean, hot iron, by using good rosin core solder, and by holding the iron against the connection long enough so that the solder flows freely around the wire or terminal. Make certain all screw and nut electrical connections are clean and tight. Use shakeproof washers whenever they are called for in the text.

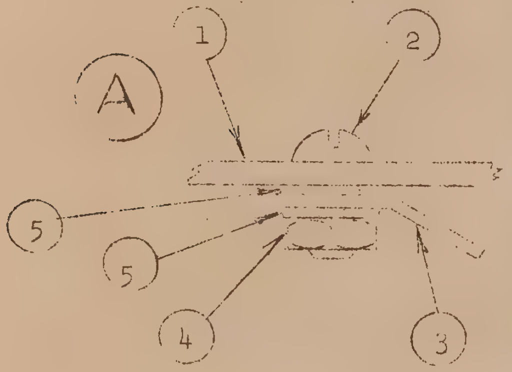
Mounting the front panel is postponed until one of the last operations to avoid the possibility of scratching the panel. The parts which mount on the front of the chassis behind the front panel are equipped with two mounting nuts so that it is not necessary to remove them in order to mount the panel when that stage is reached.

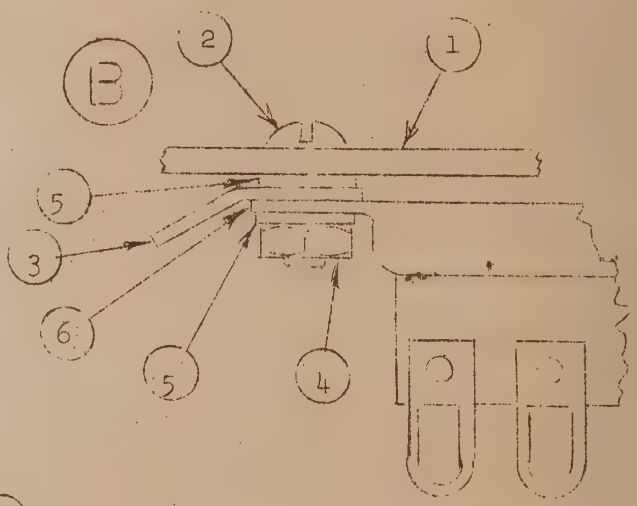
The photographs, schematic diagram, and charts referred to in the following assembly details, or which may be useful in several phases of assembly, are in the rear of the Operating Manual supplied with the Viking II. Study the Operating Manual thoroughly, but in particular, read the warning on Page 1, the license notice of paragraph A1 on Page 3, The Theory of Operation, and Viking II Tuning Details, before testing or operating the Viking II.

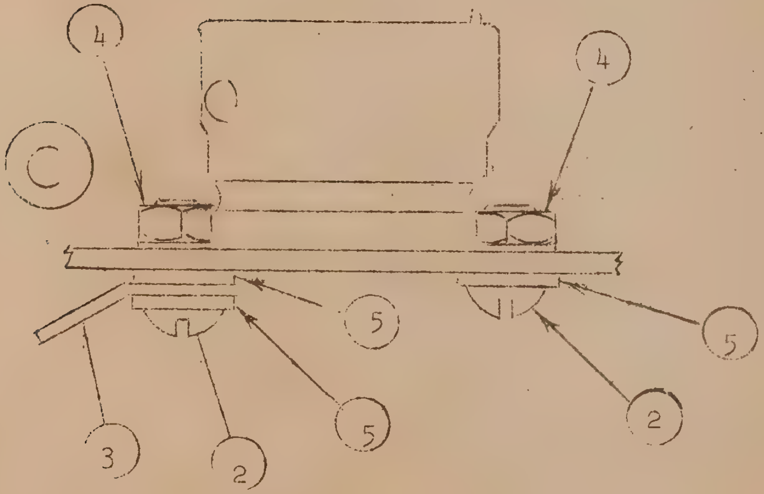
SPECIAL NOTICE

There are numerous points throughout the Viking II where grounds are made directly to the chassis by means of solder terminals. In almost every case, contact resistance between the chassis and solder terminal is very low and results in an excellent ground connection. Occasionally however, a high resistance chassis ground occurs because of oxidation of the aluminum. (The chassis has been etched and given additional treatment to preserve its appearance while being handled during assembly of the kit.)

An extra shakeproof washer, installed between each solder terminal and the chassis, will insure 100% effective grounds. Sketch A below illustrates how a typical ground connection should be made. Sketch B shows the recommended method of making ground connections at the ends of terminal strips. Sketch C shows assembly detail of ground connections at miniature tube sockets X1, X2, X5, X6 and X11.







1. Chassis
2. Screw
3. Terminal
4. Hex Nut
5. Lockwasher

VIKING II TRANSMITTER KIT

Assembly Details

1. In order to be able to work on the transmitter in an inverted position without damaging the parts mounted above the chassis, four legs roughly 3/4" x 1 1/4" x 11 1/2" should be made of scrap wood. Four 7/32" diameter holes are provided in each end of the chassis for the 1" 10-32 machine screws and nuts supplied for bolting the legs to the chassis. Mount legs so that the chassis is 1/2" off the bench top when right side up.

2. Mount all the tube sockets, the VFO power socket, and the crystal selector socket in the positions shown on Figure 1, according to the following directions. (Figure 1 may be found in the Instruction Manual).

    a. Mount socket X5, 7 pin miniature with shield base, using 3/16" 4-40 machine screws, shakeproof washers and nuts. The nuts must be on top of the chassis with the shakeproof washers and screwheads underneath. (This avoids the danger of short circuits to socket terminals.) A #6 teardrop solder terminal should be fastened under the mounting screw nearest the outside edge of the chassis. Pin 5 (plate) should be toward the front of the chassis. X5 is the 6AQ5 buffer/doubler socket.

    b. Mount miniature socket X6 for the 6AU6 oscillator in the same manner with pin 5 (plate) toward the front of the chassis and a #6 solder terminal under the mounting screw nearest the outside edge of the chassis.

    c. Mount miniature socket X1 for the 6AU6 audio amplifier in the same way with pin 1 (control grid) toward the front of the chassis and a #6 solder terminal under the screw head nearest the edge of the chassis.

    d. Mount X2 for the 6AU6 audio driver in the same way as X1.

    e. Mount miniature socket X11 for the 6AL5 bias rectifier with pin 2 (plate 2) toward the rear of the chassis and a #6 solder terminal under the screw near pin 3.

    f. Mount socket X4, 5 pin ceramic wafer for one of the 807 modulators, under the chassis with pin 4 (cathode) toward the front of the chassis. Use 1/2" 6-32 screws, shakeproof washers and nuts. Fasten a #6 solder terminal under the nut nearest pin 5 using a shakeproof washer under the screwhead as well as under the nut.

    g. Mount socket X3 in the same manner with pin 2 toward the front of the chassis and a #6 solder terminal under the nut nearest pin 5.

    g$_1$ Mount X28, 7 pin miniature socket atop the chassis using 3/16" 4-40 screws, nuts and shakeproof washers with the nuts on top of the chassis. This socket is located next to X3 with pin 2 toward the nearest end of the chassis.

    h. Mount sockets X8 and X9, octal ceramic wafers for the 5R4GY rectifiers, under the chassis with pin 7 toward the rear of the chassis in each case. Use 1/2" 6-32 screws, shakeproof washers and nuts.

    i. Mount the two octal ceramic wafer sockets X7 and X17 for the 6146 tubes on the sub-mounting plate CH-3 with the key slots of both sockets pointing in the same direction. Check this on Figure 1. It is possible to mount the sockets on the wrong side of the plate making it impossible to orient the socket properly.

2. i. Use 1/2" 6-32 screws, shakeproof washers and nuts. Center the sockets carefully to permit the 6146 tubes to seat against the ceramic wafer for proper holding action of the socket contacts. Mount this assembly under the chassis with the key slots toward the chassis center. Use 1/2" long x 3/8" O.D. spacers, 7/8" 6-32 screws, shakeproof washers and nuts. Use shakeproof washers under the screw heads atop the chassis as well as under the nuts.

j. Mount socket X10, octal wafer for the 5V4G low voltage rectifier, with pin 7 toward the rear of the chassis. Mount with 1/2" 6-32 screws, shakeproof washers and nuts.

k. Lay the VFO socket shield in place on the face of the octal ceramic wafer socket X12 and line up the holes in the shield with the holes in the socket. Fasten the shield temporarily in place with 6-32 screws and nuts. Bend the edges of the shield up slightly at the points where the small holes are punched. Now, before mounting the socket and shield on the chassis, connect ceramic disc capacitors as follows: C51, .005 mfd. between pin 3 of the socket and the hole near the lip of the shield; C50, .005 mfd. between pin 8 and the hole in the lip of the shield; C49, .005 mfd. between pin 7 and the hole in the lip of the shield. Using W2 wire connect socket pins 1, 2, 4, 5, and 6 to the lip of the shield. Solder all connections except terminals 3, 7, and 8. Remove the temporary screws in the assembly, mount the VFO power socket X12 and shield on the rear edge of the chassis in the right corner (with the chassis inverted) key slot away from the corner of the chassis. An octal plug or tube base may assist in centering the shield perfectly avoiding the possibility of later accidentally grounding the VFO plug pins. Use 1/2" 6-32 screws, shakeproof washers and nuts.

l. Before mounting the crystal selector socket X15, connect the two center rows of terminals all together. Remove the insulation from a 10" piece of W2 wire, straighten and form it into a "U" shape so it will fit into all the terminals of the two center rows of terminals. The center of the "U" should join the two inside terminals of crystal positions 5 and 6. Solder at all 10 of these terminals being sure that none of the terminals are pulled out of position making it difficult to insert crystals later. Use but little solder, do not let it flow down into the socket contacts. Mount the crystal socket X15 atop the chassis with positions 5 and 6 toward the front of the chassis. Use only two 1/2" 6-32 screws, shakeproof washers and nuts in the two rear holes of the socket. Adjust the socket position so that the front socket and chassis holes are lined up, then tighten the two rear screws.

l$_1$ Mount R30, 1 megohm potentiometer with the slotted shaft, beneath the chassis near X28 with the shaft extending thru the chassis. Use a 3/8"-32 nut and turn R30 so its terminals are toward X1. (R30 and R6 may be identical or R30 may be 15/16" diameter whereas R6 is 1 1/8" diameter.)

3. a. Mount terminal board X23, a 3 terminal strip, by means of 1/4" 4-40 screws, shakeproof washers and nuts on the inside rear edge of the chassis near socket X10. Install a #6 solder terminal under the mounting washer nearest the top of the chassis.

b. Mount terminal board X18 (5 terminal) parallel to the front of the chassis beside the sockets for the 807 modulators (X3, X4) using 1/4" 4-40 screws, shakeproof washers and nuts. Install a #6 solder terminal under the mounting washer nearest the center of the chassis.

c. Mount terminal board X19 (also 5 terminals) at right angles to the front of the chassis between and slightly to the rear of sockets (X1, X2) for speech amplifier. Install a #6 solder terminal under the nut nearest the rear of the chassis.

3. d. Mount terminal board X20 (6 terminals) at right angles to the front of the chassis between the 6146 sockets (X7, X17) and the 6AU6 oscillator socket (X6) with a #6 solder terminal under each nut.

   e. Mount terminal board X21 at right angles to the front of the chassis to the left of the 6146 sockets (X7, X17) with a #6 solder terminal under the nut nearest the front of the chassis.

   f. Mount terminal board X22 the same way at right angles to the front of the chassis opposite pin 1 of the 5R4GY socket X9 with a #6 solder terminal under the rear nut.

   g. Mount X24, 3 terminal strip vertically, inside the chassis near the VFO power socket X12. Install a #6 terminal under the bottom nut.

   h. Mount X25 (3 terminals) parallel with the front of the chassis and to the rear of the 6146 sockets. Use a #6 solder terminal under each nut and a #6 solder terminal atop the chassis under the screw head nearest the center of the chassis. Turn the strip so that the terminals are as far as possible from the rear 6146 socket.

   i. Inside the chassis, on the end and near the 807 socket X4, mount X26 vertically.

4. Make all the grounds to the chassis as follows, using #20 tinned wire except where noted otherwise. The black #20 wire (W2) should have the insulation stripped off for the very short leads.

   a. Ground the center shield and pin 4 of the 6AQ5 socket (X5) to the solder terminal under the socket mounting screw. Defer soldering until all small parts in this section are mounted.

   b. Ground the center shield and pins 2 and 3 of the 6AU6 oscillator socket (X6) to the solder terminal under the mounting screw. The lead to pin 2 should go thru the lower hole in the terminal. Solder at the ground terminal and at pin 2 (being sure not to fill the top hole with solder).

   c. Ground pins 2, 4 and the center shield of the audio amplifier socket X1 to the solder terminal under the mounting screw and solder all except pin 4 and the chassis ground lug.

   d. Do the same at audio driver socket X2 but do not solder at pins 2 or 4.

   e. Ground pin 4 and the center shield of the bias rectifier socket X11 to the solder terminal under the mounting screw. Solder at all points.

   f. Connect pin 1 of 5V4G socket X10 to the ground solder terminal of X23, solder at both points.

   g. Ground pin 5 of the 807 socket X4 and pin 5 of the 807 socket X3 to the #6 solder terminal under their respective mounting nuts. Solder at all points except pin 5 of X3.

   h. Connect the fourth terminal from the rear of terminal board X22 to the solder terminal under rear mounting nut. Solder at the solder terminal only.

4. i. Deleted

j. Using W2 hookup wire, connect sockets X8 and X9 in parallel as follows:

- Pin 6 of X8 to pin 6 of X9 and solder at X8 only.
- Pin 4 of X8 to pin 4 of X9 and solder at X9 only.
- Pin 2 of X8 to pin 2 of X9 and solder at X9 only.
- Pin 8 of X8 to pin 8 of X9 and solder at X8 only.

5. a. Solder a 2" length of #24 bare wire to the outside terminal of position 6 and also to the outside terminal of position 5 of the crystal socket X15. Leave the ends of these unconnected for the moment.

b. Mount the bracket BKT7 under the chassis by means of 1/2" 6-32 screws, shakeproof washers and nuts thru the front of X15. The outside of the bend in the bracket is toward the front of the chassis.

c. Cover one of the leads of the 50 mmf. capacitor C14 with spaghetti and solder the end to the terminal of crystal position 6 at the point where it was soldered to the "U" shaped common lead on X15. Leave the other end temporarily unconnected.

6. a. Mount the crystal selector switch SW8 on the bracket BKT7, the shaft toward the front edge of the chassis. Looking at the switch from the rear, call the rotor terminal #1 and the next terminal in a clockwise direction 2 and so on around the switch, the last terminal being 12. Using a 3/8"-32 nut secure SW8 temporarily with terminals 1 and 7 lying on a line perpendicular to the top of the chassis.

b. Install one of the 3/8-32 panel bearings D17 in the hole in front of the chassis in line with the shaft of SW8. The threaded portion extends thru the chassis to the front. Secure with a 3/8"-32 nut.

c. Slip one of the split sleeve couplings D19 on the shaft of the crystal selector switch SW8. Loosen the screws in BKT7 slightly.

d. Slip the 1/4" x 5 1/2" shaft extension D11 into the coupling D19, on the crystal selector switch SW8. Adjust the position of BKT7 slightly so that the shaft of SW8 and the shaft D11 line up nicely, then tighten the screws in BKT7 permanently. Remove the coupling D19 and shaft extension D11.

e. Solder the short lead from terminal ⑥ on the outside edge of the crystal board X15 to terminal 6 on SW8.

f. Solder the short lead from terminal ⑤ on the outside edge of X15 to terminal 7 of SW8.

g. Using #24 wire, connect and solder the outside terminal of crystal position ⑦ to switch terminal 5.

h. In the same way connect and solder a lead from crystal position ④ to switch terminal 8.

i. Connect crystal position ⑧ to switch terminal 4.

6. j. Connect crystal position 3 to switch terminal 9.

k. Connect crystal position 9 to switch terminal 3.

l. Connect crystal position 2 to switch terminal 10.

m. Connect crystal position 10 to switch terminal 2.

n. Connect crystal position 1 to switch terminal 11. Terminal 12 on the switch is left unconnected for the time being as well as terminal 1.

7. a. Mount bracket BKT4 for the 160 meter auxiliary switch SW6 atop the chassis in the position shown on Figure 1. The mounting holes are approximately 4 1/2" from the front of the chassis slightly to the right of the center. These holes are behind the pair of half-inch holes (spaced 2" apart) provided to permit the drive cable to pass thru the chassis. The horizontal edge through which the screws pass should be toward the chassis rear. Use 1/4" 6-32 binding head screws, shakeproof washers and nuts.

b. Mount bracket BKT5 in exactly the same manner under the chassis in the pair of mounting holes in front of the 1/2" cable clearance holes. See Figure 2. The horizontal edge should be to the rear.

c. Mount the 5 1/2" shaft and bearing assembly D15 in bracket BKT5 with the shaft extending thru the front edge of the chassis as shown in Figure 2. Secure in place with two 3/8-32 nuts, the second nut locking the first. Obtain additional nuts from the hardware envelope.

d. Mount pulley D4 on the rear end of D15, the hub toward the front of the chassis and the rim of D4 centered over the 1/2" chassis holes.

e. Mount the 160 meter auxiliary switch SW6 on the bracket BKT4 with the shaft toward the front of the chassis and the indexing ball toward the left edge of the chassis. The SW6 assembly screws should be on a line perpendicular to the top of the chassis. Use the 3/8-32 nut and shakeproof washer furnished with the switch.

f. Install the drive pulley D3 on the shaft of SW6 with the hub side toward the front of the chassis. The opening in the rim should be downward (toward the chassis), with SW6 turned to its counter-clockwise position looking at the end of the shaft. The pulley should be centered over the half inch holes provided for passing the drive cable thru the chassis.

g. Cut a 34" length of dial cord D7 (two lengths of the chassis). Slip one of the dial cord tension springs D9 on the cord, tie it in the center of the cord with an overhand knot.

h. Hook the tension spring D9 on either of the ears of D3. Check SW6 to be sure it is still in the counter-clockwise position.

i. Fasten a knob on the shaft D15 so that in the process of stringing the dial cable you can keep the pulley D4 from turning.

j. Pass one end of the cable D7 thru the break in the rim of the pulley D3, around D3 in a counter-clockwise direction looking from the front of the chassis, and thru the corresponding 1/2" hole in the chassis.

7. k. While holding the end of the dial cable under the chassis, turn the knob on the shaft D15 so that the break in the rim of the pulley D4 is nearest the chassis. Holding the knob with the left hand, string the cable around the pulley D4, thru the break in the rim and under the nearest ear on the pulley. Hold the pulley and dial cord with the right hand. Using a screwdriver, push the ear of D4 so that it grips the dial cord. Tension need not be kept since the critical dimensions are now set and if the cable falls off the pulleys, it can be readily re-strung. Tie an overhand knot in the clamped end of the cable, slide the knot down to where the cable is clamped and draw the knot tight.

l. Twist the knob on shaft D-15 in a counter-clockwise direction so that the dial cord is now under tension. String the thus far unused end of the dial cord around the pulley D3 in a clockwise direction, thru the corresponding 1/2" hole in the chassis, around pulley D4 in a clockwise direction. Increase the tension in the cord so that it is good and tight! Now holding D4 and the cable in the right hand, clamp down the other ear of D4 over the cable. Tie an overhand knot in the end of the cord and slide it down tight against the ear and draw tight. Check the cable to make sure that there is no backlash in the switch operation and that the cable does not cross on the pulleys causing them to bind. Trim off excess length of cable, leaving about 1/2".

8. a. Mount bracket BKT8 atop the chassis, just to the right of the socket X5 by means of a 3/8" 10-32 screw, shakeproof washer and nut. Install a flat #10 solder terminal under nut. The outside of the bend in the bracket should be toward the front of the chassis. This is the bracket holding switch SW4 in figure 3.

b. Locate the exciter bandswitch SW4. Looking at the rear deck of the switch from the rear and with the blank section of the switch to the left, call the topmost terminal #1, the next one 2 and so on around the switch deck in a clockwise direction, the last one being terminal #7. Connect a jumper of SW2 wire between terminals 1 and 7 of the rear deck of SW4. Do not solder.

c. Also on the rear deck of SW4, connect R21 (4700 ohms 1 watt) between terminals 1 and 4, jumper terminal 4 to terminal 3.
Connect R22 (22ohm 1/2 watt resistor) between terminals 4 and 5, solder terminal 5. Both resistors should be close to the switch deck and they should not extend past the ceramic wafer.

d. Consider now the front deck of SW4. Looking at it from the shaft end call the terminals #1 thru #7 in a clockwise direction. (With the blank section to the left, #1 is the top terminal.) Connect a jumper of W2 wire between terminals 1 and 7 of the front deck. Do not solder.

e. On a line at right angles to the front of the chassis just to the right of BKT8, you will find two holes approximately 5/32" diameter. Install a small grommet in each of these holes.

f. Mount SW4 in bracket BKT8 using the 3/8"-32 nut and shakeproof washer. Looking from the front of the chassis, the switch should be turned so the terminals of the front deck are toward the right end of the chassis and the switch assembly screws on a line perpendicular to the top of the chassis.

8. g. Thru the rearmost grommet under SW4, pass one lead of R20 (100 ohms 1 watt) and connect to terminal #7 (bottom terminal) of the rear deck of SW4. Leave the resistor lead full length.

h. Thru the same grommet, pass one lead of C19 (.005 mfd. ceramic capacitor), also thru terminal 7. Draw C19 down to within 1/4" of the chassis, trim the lead and solder terminal 7.

i. Thru the grommet under terminal 7 of the front deck of SW4 pass one lead of L20 (4.7 microhenry choke) and connect it to terminal 7 of the front deck of SW4.

j. Make up C23 by paralleling two .005 ceramic capacitors, twisting the leads together. Pass one of the leads of C23 thru the front grommet under SW4 and connect to terminal #7, drawing C23 down to within 1/4" of the chassis. Trim the lead from C23 to length and solder terminal 7.

9. a. Mount the oscillator coil L4 atop the chassis terminals toward the front by means of shakeproof washers and 6-32 nuts behind and slightly to the left of SW4 looking from the front of the chassis. Install a #6 solder terminal under the nut nearest the center of the chassis. (Coil may be identified by 5 spacewound turns at the bottom.)

b. Wire all the taps of L4 with #24 tinned, bare wire, keeping all the leads as short as possible without applying strain at the taps. Straightening the wire by drawing it thru the fingers several times will improve the appearance of this work. Connect the tap nearest the bottom of L4 (not the end terminal) to terminal 2 of the rear deck of SW4, solder at both points.

c. Connect the first tap (approximately 50 turns from the top of L4) to terminal 6 of the rear deck of SW4 and solder at both points.

d. Connect the next lower tap of L4 to terminal 4 of the rear deck of SW4 and solder.

e. Solder terminal 3 of the rear deck of SW4.

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f. Cut off the wire lead on the top end terminal of L4. Between the top terminal of L4 and terminal 1 of the rear deck of SW4, connect with #24 tinned wire and solder at both points.

g. Cut off the wire lead on the bottom terminal of L4 and solder in its place a 2" length of #24 tinned wire.

10. a. Mount bracket BKT9 atop the chassis, to the right of SW4 and next to the 1/2" hole near the front edge of the chassis. Mount the bracket flush with the edge of the chassis, the outside of the bend in the bracket to the front. Use a 3/8" 10-32 screw, shakeproof washer and nut. Install a large grommet in the hole to the left of BKT9.

b. Mount the drive control R25 (25,000 ohm 4 watt potentiometer) in BKT9, the shaft toward the front and the terminals toward the left edge of the chassis.

10. c. Mount the high frequency buffer coil behind R25, parallel to the front of the chassis and its tap toward the rear as per Figure 4. The #14 lead of L5B passes thru the hole in the chassis. Shape the straps mentioned in the following steps for easy connection to the front deck of SW4 terminals 5 and 6, before securing L5B. Use 3/8" 6-32 screws and shakeproof washers furnished on L5B's insulators and at the same time, mount the bracket BKT6 under the chassis, the outside of the bend in the bracket toward the front of the chassis. This bracket is for the buffer tuning condenser C22.

d. Connect the left hand strap on L5B to terminal 5 of the front deck of SW4. Do not solder.

e. Connect the mid-tap on L5B to terminal 6 of the front deck of SW4 and solder.

f. Cut off the wire lead from the bottom terminal of L5A. Solder 3 inch lengths of #24 tinned bare wire to the bottom terminal of L5A and to the tap next to the bottom terminal.

g. Mount the buffer/doubler coil L5A just to the right of (looking from the front of the chassis) the rear deck of SW4 and directly in front of the 6146 sockets (X7, X17). The coil has all its taps and terminals in a line. The terminals will be to the left and slightly toward the front of the chassis. Use shakeproof washers and 6-32 nuts.

h. Pass the lead from the bottom terminal of L5A thru terminal 5 of the front deck of SW4 and solder.

i. Pass the lead from the tap next to the bottom terminal of L5A thru terminal 4 of SW4 and solder.

j. Connect the next higher coil tap of L5A to terminal 3 of SW4 and solder.

k. Connect the next higher coil tap of L5A to terminal 2 of SW4 and solder.

l. Connect the top terminal of coil L5A to terminal 1 of SW4 and solder. Each of the coil taps and terminals and each of the 7 terminals of SW4 should now be connected and soldered.

11. a. Using 1/4" 6-32 binding head screws, shakeproof washers and nuts, fasten shield S4B to shield S4A. In order to see the positions of these shields slip the smaller of the shields between the decks of SW4. The slot in the small shield will clear the switch. Place the larger of the shields atop the chassis, the edge having the punched holes down. The shield will fit between the 6146 tubes and the oscillator coil L4; also between the buffer coil L5A and the 6146 sockets. The front edge of the shield will be beside the potentiometer R25. After screwing the shields together install 6-32 spade bolts in each of the holes at the bottom of the shield assembly. Use 1/4"-6-32 binding head screws passing first thru the spade bolts, then thru the shield; shakeproof washers and nuts. The spade bolts must be either on the sides of the shield facing the front of the chassis or the right end of the chassis looking from the front. The spade bolts will then fit correctly in the chassis holes without the necessity for distorting the shield. It may be necessary to adjust the spade bolts so that they are perfectly aligned before they will drop right in the holes.

11. a. Secure the shield with shakeproof washers and 6-32 nuts, installing a #6 solder terminal under the chassis, under the nut at the front edge of the chassis which will be used as a ground for the pilot light. Atop the chassis, under the nut used to secure the spade bolt (to the shield) which will be at the left edge of the chassis, install a #6 solder terminal turned toward the right. This terminal will be used later as a ground terminal for the rotor of the oscillator tuning capacitor, C18.

b. Locate the oscillator tuning condenser C18 (75L15 JOHNSON), the small variable with a short shaft. Solder a 1 1/2" length of #14 bus wire to the rotor contact at an angle of 45 degrees from the stator center line down and to the left looking from the shaft end.

c. Install C18 in the hole in the shield near SW4, the shaft extending thru the hole from the rear. Form the bus installed in operation b and pass it thru the hole in the ground terminal installed in operation a. Use two 3/8-32 nuts to secure C18, the second nut to serve as a lock nut. Solder at the ground terminal.

d. Connect the bottom lead of the oscillator coil L4 to the closest stator terminal of C18.

e. Install a small grommet in the hole beside the oscillator socket X6.

f. Strip all but 1" of the insulation off a 3" piece of W2 wire and pass one end down thru the grommet just installed thru terminal 5 of X6. Connect the other end of the wire to C18 and solder at C18 only.

12. a. Mount the final inductor L9 atop the chassis directly over the six ventilation holes near the front edge. The front of the inductor is the end where the pitch (spacing between turns) is least, and should be toward the front of the chassis. Use 3/8" 8-32 screws, shakeproof washers and nuts. Before proceeding, remove a mounting bracket from one end of the high voltage divider R13 (20,000 ohm 50 watt resistor), mount the bracket and a #10 solder terminal under the forward mounting nut, of the final inductor L9 (under the chassis). Orient the bracket to support R13 later, as shown in Figure 10.

b. Connect a piece of #14 tinned wire between the solder terminal on the front end frame of L9 and the 8-32 screw terminal on the same end of the inductor. Form an eye on the #14 wire and tighten between the nuts of L9's 8-32 terminal. Solder at the solder terminal.

c. Mount the flexible coupler D16 on the front drive shaft of L9. Turn L9 so that the roller contact is against the front stop.

d. For convenience in shipping the tuning mechanism BKT1, the gear which will be later used to drive the condenser C29, may have been fastened to the shaft and pinion of the tuning mechanism. This gear should be removed and the drive shaft and pinion removed.

e. Fasten the short end of the pinion and shaft assembly in the flexible coupler D16.

f. Slide BKT1 over the shaft and mount it directly in front of the final inductor L9 using 3/8"8-32 screws, shakeproof washers and nuts. From this point thru operation 12h leave screws just finger tight.

g. Mount BKT2 behind the final tuning inductor L9, with the outside of the bend in the bracket toward the right edge of the chassis, looking from the front. Refer to figure 6. Use 3/8" 10-32 screws, shakeproof washers and nuts.

h. Mount bracket BKT3 between brackets BKT1 and BKT2 using 5/16" 10-32 screws and shakeproof washers at the front and 3/8" 10-32 screws, shakeproof washers and nuts at the rear. Loosen the top bearing in BKT1 but do not remove. Tighten the screws securing BKT1, 2 and 3.

i. Take the loose gear from BKT1 and hold it behind the top bearing in BKT1 with the hub toward the chassis rear, set screws up and with the gear teeth in mesh with the small gear near the center of BKT1. Pass the shaft of variable condenser C29 (large 350 mmf. capacitor with long shaft) thru the hub of the gear and the bearing in BKT1. Permit C29 to rest on the final inductor L9.

j. Fasten the mounting feet provided in the hardware envelope (23.08-2) on the 400 mmfd. capacitor C30 (400 E15) using the screws provided and #6 shakeproof washers.

k. Pass a 1/2" 6-32 screw thru the rear bracket of C30, thru the rear mounting hole in BKT3 and the rear bracket of C29. Secure with a shakeproof washer and nut.

l. Secure the front bracket of C30 to BKT3 using a 1/4" binding head screw with two shakeproof washers under the head. BKT3 is tapped.

m. Secure the front bracket of C29 to BKT3 using half inch 6-32 screw, shakeproof washer and nut.

n. With the roller of the inductor L9 at the front stop and with C29 fully meshed, adjust the position of the gear on the shaft of C29 so that the groove in the gear's hub clears the gear below. Tighten set screws.

o. Tighten the top bearing in BKT1. Attach a knob temporarily to the final tuning shaft and check to see whether or not the tuning assembly turns freely. Look down past the shaft of C29 and check to see if the tuning shaft is exactly parallel with it. If not, loosen the mounting screws of BKT1 and adjust it so the two shafts are parallel. (This will aid in installing the panel later.) A drop of oil on the bearings of BKT1 will aid in making the tuning smooth. Do not lubricate the roller or trolley of L9.

13. a. Mount bracket BKT10 beneath the shaft of C30 using a 3/8" 10-32 screw, shakeproof washer and nut, the outside of the bend in the bracket toward the front of the chassis. Mount the coupling switch SW5 in bracket BKT10, the shaft toward the front of the chassis and the switch turned so that the blank portion is toward the bottom and the two rotor contacts are on a line perpendicular to the top of the chassis. Use a 3/8" - 32 nut and shakeproof washer.

13. b. Fasten a #6 solder terminal under the nut of the bottom front stator terminal of the output tuning condenser C30 and pointing toward the chassis. Between this terminal and the two rotor lugs (left hand) of SW5, connect a piece of #14 wire and solder.

c. Locate C36 and C37 each 300 mmf. 600 WV mica capacitors with stamped terminals. Lay these two capacitors together, terminals touching and with mounting holes together. Using the lower right hand end frame screw of C30 (looking from the front) mount C36 and C37 together, with their regular mounting holes to the right, by means of the capacitors' solder terminals. At the same time, install a #6 solder terminal under the screw head pointing up.

d. Under the screw in the front mounting bracket for C30 (nearest the shaft) install a #6 solder terminal pointing toward the chassis. Bend this terminal and the terminal in the previous operation so they project to the front.

e. Form a "U" shaped piece of #14 wire with sharp corner bends to fit the terminals just installed. The sides of the "U" should be approximately 1 1/2".

f. Locate capacitor C38, 150 mmf. WV mica. Turn the capacitor so that the mounting holes are to the left and the face of the capacitor adjacent to the solder terminals toward you. Twist the top terminal of the capacitor about 45 degrees and with the capacitor facing the same direction, slip the bent terminal over the #14 wire. Slide the ends of the "U" shaped wire into the terminals on C30 and adjust its position so that the flat side is parallel to the chassis and the end of C38 is flush with the ends of C37 and C36. Solder the #6 terminals but not the terminal of C38.

The steps g., h., and i. can be accomplished with #16 bare copper wire if available, if not, then with parallel conductors of #20 wire furnished with the kit.

g. Using a straight lead, cut to fit, connect the bottom terminal of C38 to the extreme right hand terminal of SW5 looking from the front of the chassis. Solder at both points.

h. Bend the bottom terminals of C36 and C37 so there is no danger that they short together. Connect the bottom terminal of C37 (front condenser) to the terminal next to the right hand terminal of SW5, solder at both points.

i. Connect the bottom terminal of C36 (rear condenser) to the next adjacent terminal of SW5 and solder.

j. Install C35, .0003 mfd. 450 V molded mica in front of C38 against the edge of C37 and the end flush with the end of C38. Connect the top lead to the #14 wire and the bottom lead to the next adjacent terminal of SW5, solder at SW5 only.

k. Install C34 next to C35, connect the bottom lead to the next adjacent terminal of SW5 and solder at SW5 only.

13. 1. Install C33 next to C34, connect to SW5 and solder. Solder all the condenser leads and the terminal of C38 on the #14 wire.

14. a. Mount bracket BKT12 atop the chassis, outside of the bend flush with the front edge of the chassis, next to the switch SW5 (output coupling switch) using a 3/8" 10-32 screw, shakeproof washer and nut.

b. On the long end of the 1 5/8" shaft and bearing assembly D14, slip pulley D5, hub side toward the bearing.

c. Slip D14 into the hole in BKT12 from the rear and secure with the 3/8" -32 mounting nut on the assembly.

d. Adjust the position of the pulley D5 on the shaft of D14 so that it clears the shield base of the socket X2 by 1/4". (The hub of the pulley will be almost exactly flush with the end of the shaft.)

e. Slip pulley D6 on the front shaft of the output coupling capacitor C30, the hub to the rear. Adjust the position of the pulley so that it lines up with pulley D5, the opening in the rim toward pulley D5, and with C30 at full capacity.

f. With the pulley D5 turned so that the opening in its rim is toward C30, run a 3/4" 8-32 screw thru the hole (stamped in the pulley) nearest the rim and just to the left of bracket BKT12. Pass the screw thru the pulley from the rear to front. Secure with a shakeproof washer and nut. This is the stop for the drive assembly.

g. Readjust the position of D5 on the shaft D14 so that the end of the screw installed in 13 f. is exactly flush with the front edge of bracket BKT 12.

h. Now, making use of the stop just provided, install the drive cable in a similar manner as the drive cable for the 160 meter switch SW6 described in part 7 j thru l. The tension spring should be fastened to pulley D5 on shaft assembly D14. It will not matter if C30 is allowed to turn during the assembly of the cable. The pulley on C30 should be loosened after the cable has been strung and re-tightened after adjusting C30 to maximum capacity with the drive pulley at the counter-clockwise stop. Do not be afraid to tighten the cable and make sure it can be rotated to the limits of the stops without jumping off the pulleys.

15. a. Looking at the rear of C29 and C30, remove the mounting bracket screw nearest the shaft of C30 and the end frame screw at the bottom and to the left of the shaft of C29. These screws are then used to attach the jumper strap BKT15 (16.1088) used to bond C29 and C30.

b. Remove the mounting screw of the 6146 sub panel nearest the rear end of the final tuning inductor L9. Attach the tank grounding strap BKT14 (16.1089) to C29 using two 1/4" 6-32 binding head screws and shakeproof washers. Attach the other end to the chassis replacing the 7/8" 6-32 screw and spacer. It will be necessary to twist the bottom of the strap about 1/4 turn to the right. The strap must be positioned so as not to interfere with the stator connection of C29. Fasten two #6 solder terminals under the nut below the chassis for grounding the 6146 cathodes later.

16. a. Looking at the 160 meter switch SW6 from the rear of the chassis, call the

16. a. first terminal to the right of the top nut (used in assembling the switch) terminal #1. Call the others in order in a clockwise direction #2, 3, etc. around to the one just to the left of #1 which will be #12.

b. Fasten a flat #10 solder terminal under the 8-32 screw terminal on the rear of the final inductor L9 and connect a piece of #14 wire between this terminal and terminals 2 and 3 on the 160 meter switch SW6 and solder.

c. Connect a #6 terminal on the bottom rear stator terminal of the coupling capacitor C30. Solder a piece of #14 wire between this terminal and terminals 11 and 12 of the 160 meter switch SW6.

d. Connect a jumper consisting of double leads of bare #20 (W2 wire) between terminals 5-6 of the 160 meter switch SW6. Connect another jumper between terminals 8-9. Solder only at terminals 6 and 8.

e. Straighten the leads of the 160 meter auxiliary inductor L10. Set it in position behind SW6 as shown in Figure 7. Measure the lead length necessary to connect the top lead to terminal 5 of SW6 and the bottom lead to terminal 9 of SW6.

f. Strip insulation from the leads of L10, connect to terminals 5 and 9 of SW6 and solder.

g. Secure L10 with #6 shakeproof washers and nuts installing a #6 solder terminal under the rear stud of L10.
Note: Terminals 1, 4, 7, and 10 of SW6 should be blank.

17. a. Mount the residual high frequency coil L8 on the bottom rear stator terminal of the tuning condenser C29 as shown in Figure 7, by means of its attached solder terminal using a #6 shakeproof washer and nut. Place the shakeproof washer between the nut on C29 and the terminal of L8 rather than between L8s terminal and the nut used to secure it. Thus the mounting nut can be tightened without turning the terminal of L8 and distorting the coil. Solder the plain wire end of L8 to the solder terminal on the rear of the final tuning inductor L9.

b. A silver plated spade lug is used for mounting the plate coupling capacitor C31. Place a 6-32 nut and shakeproof washer on the spade lug, turn the capacitor on to it, (2 turns only) tighten the locknut. Mount this assembly on the same terminal of C29 used to mount L8, secure with a shakeproof washer and nut. Keep capacitor C31 spaced 1/8" from the ground strap.

c. Mount the RF choke L7 behind the 6146 tube sockets using a 3/8" 8-32 screw and shakeproof washer. The empty solder terminal atop L7 should be turned toward the front of the chassis.

d. Install a grommet in the hole to the right of L7.

e. By means of a 1/4" 6-32 screw and shakeproof washer, fasten three #6 solder terminals to the coupling capacitor C31.

f. Connect and solder a straight piece of #14 wire between one of the solder terminals on C31 and the top terminal of the RF choke L7.

g. Solder one end of parasitic suppressors L11 and L12 to the remaining two solder terminals on C31.

17. h. Solder a 6146 plate cap connector to each of the other ends of L 11 and L12.

i. Connect a 4.7 microhenry choke L21 between the two bottom taps of RF choke L7. Connect C46 (.01 mfd. ceramic disc capacitor) between the bottom tap and the solder terminal on the chassis near L7. Connect C32 (.01 mfd. ceramic disc capacitor) between the other lower tap of L7 and the solder terminal on the chassis. Keep all leads as short as possible, solder at all points. Position the capacitors so they are clear of the chassis.

18. a. At the front, right end of the chassis mount bracket BKT11, the outside of the bend in the bracket flush with the front of the chassis. Use a 3/8" 10-32 screw, shakeproof washer and nut.

b. In the large hole just to the left of BKT11, install a rubber grommet.

19. a. Invert the chassis and with the front toward you, lay the wiring harness in position. (The diagram of the wiring harness located at the rear of the operating manual will aid in identification of leads and in properly orienting the harness.) At one extreme end of the harness you will find a bundle of 6 leads, three of them green, two red and one brown. These are the VFO power leads and should be in the rear, right hand corner of the chassis (looking from the bottom). Diagonally opposite, in the front, left hand corner of the chassis (looking from the bottom) you will find a bundle of 10 leads, one blue, one brown, one grey, one black, one orange, one white, one yellow, one violet, one red and one green. Run all except the red and the green lead thru the grommet and pull the leads up until the bend is snug in the grommet. These are the meter leads. Following the main harness along the front of the chassis you will find, near the right, three leads tied off together one each black, white and red. Run these leads thru the grommet under the excitation control R25. At points where the harness is in close proximity to terminal boards the cables should lie as follows: to the rear of X18, to the right (looking from the bottom of the chassis) of X22, between X10 and X11, to the right of X20 and to the right of X21.
Leads in the harness will prove to be slightly long and must be trimmed to fit. The plastic covering of the wire may be readily stripped using a good wire stripper, diagonal cutters or a knife. An iron applied directly to the insulation will cause it to melt but the iron can be left on joints long enough for the solder to flow without affecting the insulation. Leads can be identified by their color and proximity to connecting terminals and it is not necessary to constantly refer to the wiring harness drawing in the course of connecting it.
In the following operations, trim leads to the correct length, strip the insulation from the ends, wrap securely on the proper terminal but DO NOT SOLDER UNTIL SPECIFICALLY INSTRUCTED TO DO SO.

b. Solder lead 20B green to pin 3 of X1.

c. Connect lead 9A (red) to the center terminal of X19.

d. Solder leads 19B and 20A (green) to pin 3 of X2.

e. Connect lead 4B (black) to the ground terminal adjacent to pin 4 of X2.

19. f. Solder lead 46B (yellow-blue) to pin 2 of X4. (Run the lead between the socket and the chassis end.) Don't fill both holes in the terminal.

g. Solder lead 15B (green) to pin 1 of X4.

h. Solder lead 40B (the longest violet lead) to pin 4 of X4.

i. Solder leads 39B and 40A (both violet) to pin 4 of X3.

j. Solder leads 14B, 15A/both green and a short jumper of W2 wire (1") to pin 1 of X3. Solder the other end of the jumper to pin 3 of X28.

j$_1$ Connect a short jumper of W2 wire (may be bare) between pin 5 of X3 and pin 4 of X28, solder at both points.

k. Solder leads 45B and 46A (both yellow-blue) to pin 2 of X3.

l. Connect lead 43B (violet) to the/center terminal of terminal board X18

m. Connect leads 48B and 49A (both green-white) to the fourth terminal from the end of the chassis on terminal board X18.

n. Connect lead 22B (black) to the center terminal of X26, the three terminal strip on the end of the chassis.

o. Connect leads 8B and 39A (violet) to the terminal of terminal board X22 nearest the center of the chassis.

p. Connect leads 7B and 38A (yellow) to the fifth terminal from the rear of the chassis on terminal board X22.

q. Connect leads 32B and 52A (both gray-red) to the second terminal from the rear of terminal board X22.

r. Connect leads 27B and 28A (both black-brown) to the rear terminal of terminal board X22.

s. Connect lead 42A (violet) to pin 1 of the forward 5R4 socket X9.

t. Connect lead 12B (red) to pin 3 of the 5V4G socket X10.

u. Solder lead 24B (green) to pin 3 of the 6AL5 socket X11.

v. Connect lead 21A (white) to pin 6 of the 6AL5 socket X11. (Use the hole in the terminal nearest the chassis.)

w. Connect lead 29A (white) to the terminal of terminal board X23 nearest the underside of the top of the chassis.

x. Connect lead 27A (black-brown) to the center terminal of X23.

y. Connect lead 31B (blue-orange) to the terminal of X23 nearest the edge of the chassis.

z. Connect lead 47B (gray) to the terminal of terminal strip X25 nearest the crystal socket X15.

Note: Lead 52B (gray-red) is left unconnected at this time.

20. a. Connect leads 10B and 12A (both red) to the terminal of terminal board X24 nearest the bottom edge of the chassis.

b. Connect leads 13B, 16A and 24A (green) to the terminal of X24 nearest the underside of the top of the chassis.

c. Connect lead 50B (brown) to the center terminal of X24.

d. Connect leads 16B and 17A (green) to pin 4 of X6.

e. Connect leads 17B and 18A (green) to pin 3 of X5.

f. Connect lead 3B (gray) to pin 2 of X5.

g. Connect lead 25B (white) to pin 6 of X5.

h. Connect lead 23B ~~24B~~ (black-brown) to the second terminal from the front of the chassis on terminal board X20.

i. Connect leads 9B, 10A and 11A (red) to the 3rd and 4th terminals from the front of the chassis on terminal board X20. Jumper these terminals together with the excess of one of the leads.

j. Connect leads 34A and 50A (brown) to the fifth terminal from the front of the chassis on terminal board X20.

k. Connect lead 1B (blue) to pin 7 of the 6AU6 oscillator X6.

21. a. Connect leads 6B and 21B (white) to the fourth terminal from the front of the chassis on terminal board X21.

a_1 Connect lead 54 (blue) to the rear terminal of X21.

b. Connect lead 22A (black) to the third terminal from the front of terminal board X21.

c. Connect lead 23A (black-brown) to the second terminal from the front of X21.

d. Connect lead 5B (orange) to the terminal of X21 nearest the front of the chassis.

e. Solder lead 37B (black) which comes out of the harness very close to the front mounting nut of L9 to the terminal under this nut.

22. a. Screw the 120 volt indicator lamp 6S6 into the high voltage indicator socket X13A. Mount the socket behind the front edge of the chassis, bracket to the left with the filament of the lamp centered over the hole (the one, of a pair, nearest the underside of the top of the chassis). The bracket is directly under the shaft for the 160 meter switch. Use a 1/4" 6-32 binding head screw, shakeproof washer and nut. Solder lead 33B (gray-red) to one of X13's terminals, solder lead 28B (black-brown) to the other terminal. Polarity need not be observed.

b. Screw the 6 volt, #40, lamp in the low voltage indicator socket X14A.

22. b. Mount the socket behind the front edge of the chassis, bracket to the right, the lamp centered over the hole (the one of a pair nearest the underside of the top of the chassis) beneath the drive control R25. Use a 1/4" 6-32 binding head screw, shakeproof washer and nut. Connect a bare piece of 20 wire between the terminal of X14A nearest the top of the chassis and the solder terminal under the shield mounting nut next to the front of the chassis. Solder at both points being careful not to touch any of the harness leads with the iron. Solder leads 18B and 19A (green) to the other terminal of X14A.

c. Mount the keying jack J2 in the front edge of the chassis directly under the bandswitch SW4 with the solder terminals of J2 to the left. Strip 1 1/2" of insulation off the black lead 26B, run it thru the heavy ground lug of J2 to the terminal of J2 nearest the front of the chassis. (If 26B is a little short, draw the required length out of the harness.)

d. Between the only empty terminal left on J2 and the terminal of terminal board X20 nearest the front of the chassis, connect L19, 4.7 microhenry choke.

e. Between the two rear terminals of J2, connect C43, .005 mfd. ceramic disc capacitor, using the shortest possible leads. Solder all three terminals of J2.

f. Connect lead 36B (blue) to the terminal of X20 nearest the front of the chassis and solder.

g. Mount the low voltage switch SW1 (SPST) in the front edge of the chassis in the hole nearest the bottom edge of the chassis and just above the indicator light in X14A. Use the pair of hex nuts to adjust the switch shank so that about 1/4" to 5/16" protrudes thru the front of the chassis. Solder lead 29B (white) to one of the switch terminals, 30A (blue-orange) to the other. Turn the switch now so that the terminals are toward the underside of the top of the chassis. (Put the knurled nut back on the switch to avoid losing it.)

h. Mount the high voltage switch SW2 (DPST toggle) above the 120 volt indicator X13A using the pair of hex nuts and adjusting the length of shank protruding thru the front of the chassis to the same as that of SW1. The body of the switch should be perpendicular to the top of the chassis, the bushing keyway toward the bottom edge of the chassis.

i. Solder leads 30B and 31A (both blue-orange) to the terminal to the left and nearest the underside of the top of the chassis. On the same side of SW2, to the terminal nearest the bottom edge of the chassis solder leads 32A and 33A (both gray-red).

j. On the right side of SW2 solder lead 37A (black) to the terminal nearest the underside of the top of the chassis. Solder lead 35B (orange) to the other terminal of SW2. (Put the knurled nut back to the switch.)

23. a. Locate the phone/CW switch SW3, 4 pole double throw ceramic wafer switch. Note that the switch is symmetrical. Looking at the switch from the rear call the first contact in a clockwise direction from either of the switch wafer mounting n nuts, terminal #1. The next terminal will be #2 and so on around the switch in a clockwise direction from the rear, the last terminal being numbered 12.

b. Connect R28 (20,000 ohms 20 watts) between terminals 8 and 11. Since the leads will be used to support R28, they should be heavy, preferably #14 wire with the ends flattened so they will pass thru the switch terminals. Keep the leads short and R28 snug against SW3. Solder at the resistor terminals only.

c. Mount the phone/CW switch in the center of the front of the chassis using a 3/8" -32 nut only. Turn the switch so that R28 is toward the underside of the chassis top and parallel to it. The resistor must be clear of the chassis.

d. Solder leads 51B (red), 47A (gray) and the lead of R28 to terminal 8 of SW3.

e. Solder lead 45A (yellow-blue) to terminal 5.

f. Solder lead 41B (gray-red) to terminal 4.

g. Solder lead 48A (green-white) and the lead of R28 to terminal 11.

h. Solder lead 44B (violet) to terminal 12.

i. Solder lead 35A (orange) to terminal 1.

j. Solder leads 2B and 34B (both brown) to terminal 2.

k. Solder lead 36A (blue) to terminal 3.

Terminals 6, 7, 9 and 10 will be left blank.

24. a. Mount the voltage divider R13 perpendicular to the front of the chassis as shown in Figure 10. One of the resistor mounting feet was earlier mounted under the nut for the final inductor L9. Place the open end of R13 over the bracket "V" and mount the other foot with a 1/4" 6-32 binding head screw, shakeproof washer and nut. Also, fasten a #6 solder terminal under the mounting nut.

b. When the resistor was shipped from the factory, the shape of the slider tap may have been deliberately distorted so that it does not make contact with the resistance element. If so, the tap must be taken off the resistor, reshaped and put back on the resistor between 1 3/4 and 2 inches from the rear terminal of R13. Do not attempt to move the tap without first loosening it.

c. Solder leads 42B, 43A and 44A (violet) to the terminal on the end of R13 nearest the rear of the chassis.

d. Solder leads 41A and 55 (both gray-red) to the slider of R13.

e. Solder leads 38B and 53 (both yellow) to the front terminal of R13.

f. Solder lead 51 (red) to pin 5 and jumper to pin 6 of X28.

g. Pass lead 49B (green-white) thru a grommet in the chassis beside the PA plate choke L7.

24. h. Connect lead 55 (gray-red) to the center shield (used as an insulated terminal) of X28. Do not solder.

i. Solder lead 53 (yellow) to pin 2 of X28.

j. Solder lead 54 (blue) to the counter-clockwise terminal of R30 (looking at the potentiometer from the rear and using the center terminal as the point of reference).

k. Solder a short jumper of W2 wire between the center terminal of R30 and pin 7 of X28.

l. Solder R29, 470,000 to 500,000 ohm 1/2 watt resistor between the center shield of X28 and the furthest clockwise terminal of R30 (looking at the potentiometer from the rear and using the center terminal as the point of reference).

25. a. Turn the chassis right side up, the left end toward you. Locate the meter switch SW7. Mount it in bracket BKT11 located on the front right corner of the chassis, using a 3/8"-32 nut only. The nuts used to assemble the switch should lie on a line perpendicular to the top of the chassis. The switch is symmetrical and may be turned with either nut up. Looking at SW7 from the rear, call the first terminal to the right of the top screw, terminal 1, the next in a clockwise direction 2 and so on around the switch, the last one being #12.

b. Solder the brown lead to terminal 6.

c. Strip 1 1/2" of insulation off the black lead, pass it thru terminal 5, slip a piece of spaghetti over the exposed lead and solder to terminal 9. Solder at terminal 5 also.

d. Solder the orange lead to terminal 4.

e. Strip 3/4" of insulation off the yellow lead, pass it thru terminal 3, solder at terminal 2. Solder also at 3.

f. Solder the violet lead to terminal 8.

g. Solder the white lead to terminal 10.

h. Solder the gray lead to terminal 11.

i. Solder the blue lead to terminal 12.

26. a. Connect lead 49B (green-white) to the bottom tap on the choke L7. Solder being careful not to dislodge the other components.

27. a. Wire the drive control R25 as follows: solder the red lead to the lug nearest the chassis.

b. Solder the white lead to the center lug.

c. Solder the black lead to the top lug.

Note: The .005 mfd. ceramic disc capacitors in the following operations should be connected with the shortest possible leads. Once again, do not solder terminals until instructed.

28. a. Connect C15, .005 mfd. between terminal 7 and the center shield of the oscillator socket X6.

28. b. Connect C16, .005mfd. between pins 4 and 3 of X6.

c. Connect C17, .005 mfd. between the fourth terminal from the front on X20 and the ground terminal at the rear of X20. Solder at the ground terminal only.

d. Beside the right side of the terminal board X20, connect C24, .005 mfd. between the second terminal from the front on terminal board X20 and the ground terminal under the front mounting nut of X20. Solder the ground terminal only.

e. Solder C21, .005 mfd., between pin 6 and the center shield of the buffer socket X5.

f. Connect C26, .005 mfd. between pins 3 and 4 of X5.

g. Connect C27, .005 mfd. between pin 2 and the ground terminal adjacent to pin 4 of X5.

h. Connect the remaining lead of C14, .00005 mfd. to pin 6 of the oscillator socket X6.

i. Connect R18, 100K ohms 1/2 watt between pins 1 and 3 of X6, solder at pin 3 only.

j. Solder a piece of W2 wire between pin 1 of X6 and the rotor terminal (#1) of the crystal selector switch SW8.

k. Connect C20, .00005 mfd. silver mica capacitor between pin 5 of X6 running the other lead thru pin 1 of X5 to pin 7 of X5. Solder at pin 5 of X6 and at pin 7 only of X5.

l. Solder SH3, 5.1 ohm 1/2 watt resistor between pin 7 of X6 and the fifth terminal from the front of X20.

m. Connect R19, 68K ohm to pin 6 of the oscillator socket X6 and to the fourth terminal from the front of the chassis on X20. Solder at X6.

n. Solder R20, 100 ohms 1 watt to the fourth terminal from the front of the chassis on X20.

o. Solder L20, 4.7 microhenry choke from terminal 7 of the front deck of SW4(B) to the third terminal from the front on terminal board X20.

p. Solder R23, 47K ohms 1/2 watt between the second terminal from the front on X20 and pin 1 of the buffer socket X5.

q. Solder SH5, 2.2 ohms 1/2 watt between pin 2 of the buffer socket X5 and the ground terminal adjacent to pin 4. Solder the ground terminal, pin 4 and pin 3.

29. a. Solder C19, .005 mfd. connected to #7 of SW4A to the ground terminal under the mounting nut of the oscillator coil L4.

29. b. Connect C23, parallel .005 mfd. to the #10 ground terminal under the nut used to mount the bracket for SW4. Keep the leads very short.

30. a. Mount the buffer tuning capacitor C22, 75 mmf. with the long shaft, in the bracket under the inductor L5B, using two 3/8-32 nuts, the second nut serving as a locknut. The bottom of the stator is parallel to the underside of the top of the chassis.

b. Solder two parallel conductors of #20 (W2) wire between the rotor of C22 and the ground terminal under the mounting nut for the bracket of SW4.

c. Connect the #14 lead of the auxiliary inductor L5B which comes from the top of the chassis, to the right hand stator terminal of C22. Make sure the #14 lead is centered in the hole and does not touch the chassis.

d. Between this same stator terminal and pin 5 of the buffer socket X5, solder a piece of W2 wire keeping it as short as possible while remaining clear of all the components near it.

e. Check to be certain that all connections in the oscillator/buffer section are soldered.

31. a. Wind choke L15, 15 turns self supporting W2 wire on a pencil or other form approximately 1/4" in diameter. Solder between pin 7 of X12 and the terminal of X24 to which the green leads are connected.

b. Solder L16, 4.7 microhenry choke between pin 8 of the VFO power socket X12 and the terminal of X24 to which the brown lead is connected.

c. Solder L14, 4.7 microH, between pin 3 of X12 and the terminal of X24, to which the red leads are connected.

32. a. Pass a #14 wire thru pins 4 and 8 of each 6146 socket (X7 and X17) and solder to the closest respective solder terminal installed earlier.

b. Connect pins 1, 6, 7 and 8 of each 6146 socket with #14 wire. Connect pin 6 of V17 to pin 1 of V7. (This can best be done by slightly deforming the socket terminals and forming the wire so that it will pass thru the holes in each of the terminals.) Solder at all points.

c. Using #20 wire (W2) connect pin 2 of X17 to pin 2 of X7 and solder at X7 only.

d. Solder a piece of #14 wire between pin 3 of X17 and pin 3 of X7. Then solder C28, .001 ceramic disc capacitor between pin 6 of X17 and the mid-point of the #14 wire connecting pins #3 of the two 6146 sockets.

e. Solder a piece of #14 wire between pin 5 of X17 and pin 5 of X7 making certain it clears all the other pins.

f. Between the mid-point of the wire just installed and the rear terminal of X21 connect RF choke L6, soldering the choke at the mid-point of the wire and using a #14 wire lead to connect to X21 and to support the choke. Do not solder at X21 as yet but solder at the end of L6.

g. Make up C25 by twisting the leads of the two 25 mmf. silver mica capacitors tightly together.

32. h. Solder C25 between the mid-point of the wire (installed in operation ~~8~~5,) and the empty stator terminal of C22. Because of limited space it may be easier to connect C25 to the #14 wire lead from L5B.

i. Connect leads 13A and 14A (green) of the wiring harness to the terminal of terminal board X25 nearest the center of the chassis.

j. Deleted

k. Between pin 3 of the socket X17 and the terminal of X25 nearest the crystal socket connect 4.7 microhenry choke L22. Solder at pin 3.

l. Between the terminal of X25 nearest the crystal socket and the ground terminal, solder C45, .001 mfd. ceramic disc capacitor.

m. Connect L23, open wound VHF choke between terminal 2 of X17 and the terminal of the terminal board X25 nearest the center of the chassis.

n. Connect C44, .005 mfd. ceramic disc capacitor between the terminal of X25 to which L23 was just connected and the ground terminal. Do not solder.

o. Solder C40, .005 mfd. between pins 2 and 1 of socket X17.

33. a. Place R24, 1800 ohm resistor on the chassis snug against the left side of terminal board X21 and connect between the end terminals of X21. Solder at the end terminal of X21 nearest the center of the chassis.

b. Connect shunt SH4, 5.1 ohms 1/2 watt between the front terminal of X21 and the fifth terminal from the front of the chassis on X21. SH4 should be on the same side of X21 as R24. Use the excess length of SH4 lead to jumper terminal 5 to terminal 4 of X21. Do not solder.

c. On the same side of X21, connect R17, 2700 ohms 1 watt, between the third and fifth terminals from the front of the chassis on X21. Do not solder.

d. On the other side of X21, connect R15, 1500 ohms, 1 watt between the second terminal from the front of the chassis and the ground soldering terminal under the front mounting nut of X21. Do not solder.

e. Also on the right side of X21, between the second and third terminals from the front of the chassis, solder R16, 820 ohms 1 watt.

f. Between the terminal of X21 nearest the front of the chassis and the ground terminal under the front mounting nut solder C39, .005 mfd.

g. Solder the fourth and fifth terminals from the front of the chassis on X21.

34. a. Mount the modulation transformer T4 (SNC P1992) atop the chassis between the meter switch SW7 and the 807 sockets X3 and X4, as shown in Figure 9, with 3/8" 8-32 screws, shakeproof washers and nuts. Use shakeproof washers under the screw heads as well as the nuts.

34. b. Snug against the right side of terminal board X19 connect C4, .1 mfd paper tubular capacitor, between the terminal of X19 nearest the front of the chassis and the rearmost terminal of X19. The ends of the paper tubular capacitors which are marked with black bands are connected to the outside foil. These are the ends which should be connected to ground or the low potential point. Use the excess length of the rear lead to connect also to the ground terminal at the rear of X19. Push the capacitor back so there is no possiblity of the front lead touching the ground lug adjacent to pin 4 of X2.

Next to C4, lying flat on the chassis, connect C54, 10 mfd. 25 volt electrolytic capacitor, the positive terminal to pin 7 of socket X2, the negative terminal to the ground terminal under the mounting nut of X18. Solder at the ground terminal.

d. Deleted

e. On the left side of terminal board, flat against the chassis and snug against X19, connect C1, 10 mfd. electrolytic capacitor between pin 7 of socket 1 and the terminal under the rear mounting nut of terminal board X19. Connect the positive end of the capaictor to pin 7, the negative end to ground.

f. Next to C1, connect C3, a .02 mfd. 400 volt capacitor between pin 6 of X1 and the rear terminal of terminal board X19, the foil end toward the rear of X19. Solder the rear terminal of X19 and ground terminal behind it.

g. Connect R2, 1800 ohms 1/2 watt between pins 4 and 7 of X1. The resistor is insulated so pull the leads thru the terminals and let the resistor lie against the bottom of the socket. Solder at both points.

h. Connect R31, 470 ohms 1/2 watt resistor between pins 4 and 7 of socket X2. Solder at both points. (This may appear as 510 ohms in the schematic diagram.

i. Connect R32, 1 megohm 1/2 watt resistor between pin 6 of X1 and the front terminal on terminal board X19. Here too, the leads can be kept very short. Solder at pin 6 of socket X1 only.

j. Bend one of the leads of R3, 470K ohms 1/2 watt resistor at right angles to the resistor body. Cut this same lead to 5/8" length and put a sharp bend in the lead 1/8" from the end. Connect this end to pin 5 of X1, connect the other end to the terminal of X19 nearest the front of the chassis.

k. Trim one of the leads of C2, .003 mfd. paper tubular capacitor to 1 1/8" length, put a sharp bend in the lead 1/8" from the end and connect to pin 5 of X1. Solder this terminal being careful to keep the iron away from C1. The other end of C2 will be left unconnected for the time being.

l. Connect R5, 22K ohms between the terminal of X19 nearest the front of the chassis and the center terminal to which the red harness lead was earlier connected. Solder the front terminal only.

35. a. Slip 3/8" of small spaghetti over one of the leads of R1, 1 meg ohm 1/2 watt. Locate the shielded wire W5, cut off 1' of both the wire and braid. Discard the inside conductor of the 1" piece just cut off. Over the end of R1 slide the 1" piece of shielding, this will be used to shield the resistor.

35. b. Form the braid snug over the spaghetti and draw the other end down tight over the resistor lead. Carefully tin the end of the braid over the spaghetti being careful not to melt the insulation, solder the other end of the braid to the resistor lead. This serves to shield the resistor R1.

c. Take the remaining piece of W5 shielded wire, slide the shield braid back and trim off the insulation of the center conductor back 1/4". Hold the end of the braid back 1/8" from the end of the insulation of the center conductor, draw the braid thru the fingers tightening the braid over the center conductor. Wrap a 2" piece of stripped W2 wire (#20) wire around the end of the braid and solder. Twist the strands of the center conductor together and tin with solder.

d. At the other end of the shielded wire lead, you will now find that the shield braid is longer than the center conductor. Cut the braid off flush with the end of the center conductor.

e. Slide the shield braid back, cut off 1/4" of the insulation of the center conductor and tin the stranded wires with solder.

f. Adjust the position of the shield braid so that it is back about 1/8" from the bare center conductor. Wrap one end of a 2" piece of stripped W2 (#20) wire around the braid and solder. This is to serve as another ground lead.

g. Connect the insulated lead of resistor R1 to terminal 1 of socket X1. Connect the other end of R1 to the ground terminal adjacent to pin 4 of X1.

h. Solder the center conductor of the previously prepared shielded lead assembly to pin 1 of socket X1. Solder the ground lead of the assembly to the ground terminal adjacent to pin 4 of X1.

36. a. Mount the audio gain control R6 (1 meg. volume control) under the meter switch. Mount with a 3/8"-32 nut and turn the terminals toward the right end of the chassis.

b. Using a short length of W2 wire but not taut, connect the terminal of R6 nearest the underside of the top of the chassis to pin 2 of socket X2 and solder at both points.

c. Using a similar length of W2 wire, connect the center terminal of R6 to pin 1 of X2 and solder at both points.

d. Connect C2, .003 mfd. previously connected to pin 5 of X1 to the remaining terminal of R6 and solder.

e. Prepare the still free end of the shielded wire W5 connected to pin 1 of X1 as follows: trim the tinned center conductor to 1/8". Cut one lead of R26, 22K ohms 1/2 watt, to 1/8" length. Solder this lead to the center conductor of the shielded wire. Slip the 1" length of large spaghetti over the resistor and the soldered connection to the center conductor of W5. Slip a 1" piece of small spaghetti over one of the leads of C52, 300 mmf. mica capacitor. With the spaghetti tight against the body of the condenser, hold the condenser so that the end of the insulation is flush with the end of the insulation of the resistor and twist the wires together. Solder the leads together and trim off all but 1/4" of the tinned leads. This will serve in a later operation to connect the center terminal of the microphone connector.

36. f. Deleted

g. Deleted

37. The modulation transformer has dual secondary windings, normally series connected by instructions a, b, and c following. If the Viking II modulator is to be used for driving a larger stage, suggestions for wiring can be found in the operating instruction manual.

a. Cut both the green/yellow and red wire of T4 to length and connect to the center terminal of X18. Solder all leads on the terminal.

b. Trim the yellow wire of T4 to length and connect to the fourth terminal from the end of the chassis on X18. Solder all the leads on the terminal.

c. Cut to length both the red/yellow and green wires of T4 and solder to the end terminal of X18 nearest the center of the chassis.

d. Trim the blue transformer lead to length, strip off 3/8" of insulation, tin with solder and connect but do not solder, to the second terminal from the chassis end on terminal board X18.

e. Trim the brown transformer lead to length, strip off 3/8" of insulation, tin with solder and connect but do not solder to the terminal of X18 nearest the end of the chassis. Save the excess lengths of the blue and brown leads.

f. Connect C55, .01 mfd. 1500 volt ceramic disc capacitor between the terminal of X18 nearest the end of the chassis and the second terminal from the end. Do not solder.

g. Install a 9/16" grommet in the hole between the 807 sockets X3 and X4. Connect the excess length of the brown lead (trimmed off in 37. e.) to the terminal of X18 nearest the end of the chassis. Solder. Run the brown lead thru the grommet just installed.

h. Connect the excess length of the blue lead (trimmed off in 37. d.) to the second terminal of X18 from the end of the chassis and solder. Run the blue lead thru the grommet installed in 37. g. Be sure that C55 is not in contact with the chassis.

i. Trim the brown and blue leads (now above the chassis) to exactly the same length, strip off 3/8" of insulation and tin with solder. Slip a 1" length G17 (.133 ID black spaghetti tubing) over each of the leads. Trim one lead of R33 and one lead of R34 (both 22 ohms 1/2 watt) to 3/8" length. (These resistors may not appear in the schematic diagram.) Form a hook in these leads. Solder one resistor (the lead with the hook) to the blue transformer lead, solder the other resistor to the brown lead. Solder an 807 plate cap (TC2 and TC3) to each of the remaining resistor leads keeping the leads short as possible. When cool, slide the tubing on the leads over resistors and soldered connections.

38. a. Mount the audio driver transformer T3 (SNC P1503) underneath the chassis on the left end above terminal board X18, with the red and the blue leads up, the yellow, green and black leads nearest the under side of the top of the chassis. Use 1/4" 6-32 binding head screws, shakeproof washers and nuts.

b. Connect the yellow to the terminal of terminal strip X26 nearest the underside of the top of the chassis.

38. c. Connect R10, 100 ohms 1/2 watt, between this terminal and pin 3 of socket X3.

d. Connect the green lead of T3 to the terminal of X26 nearest the bottom edge of the chassis.

e. Connect R11, 100 ohms 1/2 watt, between this terminal and pin 3 of the socket X4.

f. Connect C7, .001 mfd. paper tubular capacitor between the end terminals of X26. Solder at these end terminals and at pin 3 of sockets X3 and X4.

g. After cutting to length, solder the black lead of T3 to the center terminal of X26.

h. Run the red lead of T3 around the transformer and solder to the center terminal of X19.

i. Run the blue lead of T3 around the transformer and solder to terminal 5, of X2, jumper to pin 6 and solder at 6 also of X2.

39. a. Mount the high voltage transformer T1 (SNC P1781) atop the chassis in the corner between the 807 sockets and the 5R4 sockets X8 and X9, using 3/8" 8-32 screws, shakeproof washers and nuts. Use washers under the heads of the screws as well as the nuts.

b. Trim one of the red lead to length and solder to pin 4 of the 5R4 socket X8.

c. Trim the other red lead to length and solder to pin 6 of the 5R4 socket X9.

d. Trim the black leads of T1 to length and connect one lead to each of the two rearmost terminals of terminal board X22. Solder all leads of these two terminals.

e. Trim the red/yellow lead of T1 to length, strip insulation and tin with solder, connect to the second terminal from the front of the chassis on X22 but do not solder.

40. a. Before mounting the choke L1 (SNC P1783) between the 5R4 sockets X8 and X9 and the 5V4G socket X10, note that there is a small hole in the chassis inside the square formed by the mounting holes of the choke. Insert from the top of the chassis, a 1/4" 6-32 screw, into this hole and secure with a 6-32 nut.

b. Mount the choke L1 atop the chassis using 3/8" 8-32 screws using shakeproof washers under both screw heads and nuts. See Figure 9.

c. Trim to length, tin with solder and connect one of the leads of the choke L1 to pin 8 of X9.

d. Trim the other lead to length, tin with solder and connect to pin 1 of X9. Do not solder either lead.

41. a. Mount the filter choke L3 (SNC P1784) under the chassis to the rear of the crystal selector board, the choke parallel to the rear edge of the chassis and the leads emerging from the side of the choke facing the front of the chassis.

41. a. Secure only the end of the choke nearest the right end of the chassis using a 1/4" 6-32 binding head screw, shakeproof washer and nut. Transformer T2 will mount directly above and the other end of L3 will be secured by one of the mounting screws of T2. Knot the leads of L3 together so as to be able to identify them later and not inadvertently get them mixed up with the primary leads of the low voltage transformer T2.

b. Before mounting the low voltage transformer atop the chassis in the corner behind the crystal board, note that the red/yellow lead of T2 will come thru the large hole in the corner of the chassis and connect to the ground terminal under the mounting nut of terminal board X24. Since this will be a short lead and difficult to handle, once the transformer is mounted, check the lead length required, trim to length, strip insulation from the end and tin with solder first.

c. Mount the low voltage transformer T2 atop the chassis using shakeproof washers under the heads and nuts for the 3/8"-8-32 screws. Secure the free end of choke L3 at the same time. The bundle of wires containing the red leads should project thru the 5/8" hole nearest the corner of the chassis.

Note: In connecting the leads of T2, leave a little slack so that when the leads are cabled to the wiring harness, they will not be drawn excessively tight.

d. Solder one of the yellow leads of T2 to pin 2 of the 5R4 socket X8.

e. Solder the other yellow lead of T2 to pin 8 of the 5R4 socket X9.

f. Starting now near the point where the leads emerge from the high voltage transformer T1 lace all transformer leads together and to the wiring harness where they follow the same course across the rear of the chassis. Use the waxed cord furnished with the kit and lace up to the point opposite the 6-32 nut under the filter choke L1.

g. Lay the green leads from transformer T2 atop the yellow leads and just to the right of the point where the lacing was discontinued, put a right angle bend in the green leads toward the front of the chassis. Now tie the lacing off at this point using the last ties to secure the green leads at the bend.

h. Trim to length and connect one of the green transformer leads to the terminal of terminal board X25 nearest the center of the chassis (the terminal to which the open wound VHF choke is connected) and solder.

i. Trim to length and solder the other green transformer lead to the ground terminal under the mounting nut of X25 nearest the center of the chassis.

j. Trim to length, tin with solder and connect one of the brown leads of T2 to pin 8 of the 5V4G socket X10. Do not solder.

k. Connect the other brown lead of T2 to pin 2 of X10 and solder.

l. Solder one of the blue leads of T2 to pin 1 of the bias rectifier socket X11. Make this lead about 2" too long and double it back against itself

41. l. for about an inch. This will insure that when later lacing of leads is done, it will be possible to keep from straining the tube socket terminal.

m. Solder the other blue lead of T2 to pin 5 of socket X11.

n. Solder one of the red leads of T2 to pin 4 of the 5V4G socket X10.

o. Solder the other red lead of T2 to pin 6 of the 5V4G socket X10.

p. Route the black leads to terminal board X23 so that they follow the cable as far as socket X10. Solder one to the terminal of X23 to which the blue and orange/was previously connected.
lead

q. Connect the other black lead of T2 to the terminal of X23 to which the black/brown lead was previously connected. Do not solder.

r. Solder the red/yellow lead of T2 to the ground terminal under the mounting nut of terminal strip X24.

s. Route one of the leads of the filter choke L3 (SNC P1784) in the bundle of transformer leads to pin 6 of socket X11. Tin the end of the lead and connect to pin 6 but do not solder.

t. Route the other lead of L3 in the same manner removing sufficient insulation from the lead so that it can pass thru terminal 7 to terminal 2 of X11. Insert a piece of spaghetti between terminals 2 and 7 of X11, solder at terminal 2 only.

u. Starting at the right end of the chassis, lace up all the transformer leads (they can be laced to the wiring harness at the same time) back to the point where the lacing was earlier tied off. Finish lacing at the point where the green leads branch off.

42. a. Choke L2 (SNC P1501) is to be mounted on the inside rear edge of the chassis directly under choke L1. One lead connects to pin 8 of the 5V4G socket X10. The other lead connects to pin 3 of X10. Before mounting L2, cut the leads to the proper length and tin the ends. Mount L2 using one 3/8" 8-32 screw, shakeproof washers and nuts. The screw nearest the socket X8 should be a 3/4" 8-32 extending thru the chassis from the inside. This screw will serve as the transmitter ground terminal. Use shakeproof washers under the screw heads as well as the nuts. Connect the leads but do not solder.

b. Mount the dual capacitor C10-11 (dual 15 mfd., 450 volts) parallel to the rear edge of the chassis with the black lead toward terminal board X22. (Bend the end of the mounting bracket and mount under the 6-32 nut below L1.)

c. Solder one of the positive capacitor leads to pin 8 of X10.

d. Solder the other positive capacitor lead to pin 3 of X10.

e. Cut to length, tin with solder and connect but do not solder, the negative (black) lead of the capacitor to the fourth terminal from the rear of the chassis on terminal board X22.

43. a. Mount the bias supply filter capacitor C12-13 (dual 15 mfd. 150 volt) parallel to the rear edge of the chassis between C10-11 and the resistor R13. The negative (black and blue leads) should be to the right toward the 6AL5 socket X11.

b. Solder the positive leads (red, green) to the ground terminal under the rear mounting nut of the final tuning inductor L9.

c. Solder the blue lead to pin 7 of X11.

d. Solder the black lead to pin 6 of X11.

44. a. Pass the ends of shunt SH2 between the front terminal and the second terminal from the front of the chassis on terminal board X22. Solder at the front terminal only.

b. Pass the ends of shunt SH1 between the second and third terminals from the front on X22. Solder at the third terminal only.

45. a. Mount C8, .5 mfd paper tubular capacitor, parallel to the rear of the chassis behind 807 sockets X3 and X4 with the ground end toward X22. Solder one to a #6 ground terminal under the rearmost mounting stud of the 160 meter inductor L10.

b. Solder the other lead to pin 2 of the 807 socket X4.

46. a. Mount the high voltage filter capacitor C9, 8 mfd., oil filled on the left end of the chassis beneath the high voltage transformer T1, using the mounting brackets furnished in the miscellaneous hardware package. Use 3/4" 8-32 screws, shakeproof washers and nuts with washers under the screw heads as well as the nuts. Mount the capacitor with as much clearance as possible between the capacitor and the components below.

b. Try to find a sufficiently long red scrap of wire cut from one of the transformer leads and solder between the closest terminal of C9 and pin 1 of socket X9.

c. Similarly try to find a long enough scrap of black wire cut from one of the transformer leads and solder between the remaining terminal of C9 and the second terminal from the front on terminal board X22.

47. a. Mount the fuse post X16 in the 1/2" hole beside the bias rectifier socket X11.

7 b. If available, use a scrap of one of the black transformer leads and solder between the body terminal of X16 and the terminal of X23 to which the white lead was previously connected. This will be the terminal nearest the underside of the top of the chassis.

c. Lay the line filter assembly L13, consisting of three open wound chokes, down on the bench with the mounting bracket toward you, the edge of the mounting bracket up. The coils are L13A, L13B and L13C respectively with L13A to the left. Solder a #6 lug to each of the bottom, front terminals of the choke assembly.

d. Solder a 4" length of W2 wire to the top terminal of L13A. Solder the

47. d. lead to the terminal on the back side of the assembly.

e. Solder a 5" length of W2 wire to the top terminal of L13B. Solder the lead to the terminal on the back side of the assembly.

f. Install a grommet in the 1/2" hole beside the terminal board X23.

g. Pass the line cord thru this grommet, tie an overhand knot in the cord leaving approximately 1" of insulated leads extending from the knot. (Measure from the knot to the end of the insulation, do not include the tinned ends of the leads.)

h. Pull as much of the line cord as necessary thru the grommet, solder one of the leads to the bottom rear terminal of L13A, solder the other lead to the bottom rear terminal of L13B. In this way, the line cords leads need only be an inch long thus insuring that the line filter will be effective.

i. Mount the antenna relay socket J5 on the rear edge of the chassis near the choke L2, using a 3/8" 4-40 screw, shakeproof washer and nut.

j. Solder 3" leads of W2 wire to each of the terminals of J5 to be later connected to the line filter assembly L13.

k. Mount the line filter assembly between terminal strip X23 and the choke L2, using 1/4" 4-40 screws, shakeproof washers and nuts. At the same time install three flat #6 solder terminals under these nuts, parallel to the rear edge of the chassis, a single terminal pointing toward X23 under the nut nearest X23 and a pair of terminals, one pointing each direction, under the nut nearest L2.

l. Trim to length and solder the 5" lead from the top of L13B to the center terminal of X23.

m. Trim the 4" lead from the top of L13A and solder to the end terminal of the fuse post X16.

n. Solder wiring harness lead 52B (gray/red) to the top terminal of choke L13C of the line filter.

o. Connect capacitors C41, C42, and C53, .005 mfd. ceramic disc type, each bypassing the bottom terminal of one of the line chokes to ground. Connect one capacitor between the lower terminal and the ground terminal below each of the individual line filter chokes. Solder at the ground terminals and at the choke nearest X23.

p. Solder the longest lead from the antenna relay power socket J5 to the bottom terminal of L13B (center choke).

q. Solder the shortest lead from J5 to the bottom terminal of L13C.(choke nearest L2).

Check to see that all connections in this section are soldered.

48. a. Prepare the RG-8/U cable G1 and the RG-59/U cable for installation exactly as per the drawings immediately following.

b. Using an additional 6-32 nut & a #8 shakeproof washer, mount a flat #10 solder terminal on the bottom, rear stator terminal of the output coupling capacitor C30. Turn the terminal up, tighten the nut, bend the terminal down so that it lies parallel to the top of the chassis.

c. Looking from the rear of the chassis, remove the bottom, left hand 6-32 screw used to secure the tie rod of the final tuning capacitor C29.

d. Pass the RG-8/U cable assembly thru the hole in the chassis beneath C30, from the top of the chassis. Connect the ground braid of the cable to C29 by means of the screw just removed. Insert the center conductor of the cable thru the #10 terminal just installed and solder.

e. Slide the hood over the shield braid of the cable, so that the rectangular end will fit the output connector, receptacle J3 (83-1R).

f. Solder the center conductor to the center terminal of receptacle J3.

g. Push the threaded portion of J3 thru the chassis from the inside, slide the hood down over the rear of J3 and secure J3 and the hood with four 3/8" 4-40 screws, shakeproof washers and nuts.

h. Solder the tinned braid of the cable to the hood being careful not to leave the iron long and overheat the insulation of the cable.

49. a. In the hole next to the VFO power socket X12, insert the threaded portion of the connector on the RG-59/U cable assembly G2, from inside the chassis. Secure with four 3/8" 4-40 screws, shakeproof washers and nuts.

b. Route the cable assembly to the right, parallel with the transformer cable to the right end of the chassis, toward the front of the chassis between the crystal selector board X15 and the end of the chassis.

c. Insert the #20 lead, soldered to the braid of G2, thru pin 2 of the oscillator socket X6, drawing the lead up as short as possible without straining the socket terminal. Solder the wire in the terminal.

d. Let the cable form a curve and solder to terminal 12, the only remaining empty terminal of the crystal selector switch SW8.

50. a. If possible use scraps of transformer leads for this operation. Solder a black lead to terminal 7 of the meter switch SW7. Solder a red lead to terminal 1 of SW7.

b. Install the 4, 1" x 6-32 threaded studs for mounting the final window shield, in the four #6 clearance holes in the front of BKT-1. Secure the studs with 6-32 nuts on both sides of BKT1.

c. Adjust the studs so that the rear ends are flush with the face of the rear nut on each stud.

d. Secure the dial window shield S5 on the studs just installed, sliding it

50. d. over the shaft of C29, bonding fingers to the front. Install 6-32 nuts on the studs on each side of the shield. Adjust the nuts so that the ends of the studs are flush with the face of the front nuts.

e. Slide the 29.387 special spring washer over the shaft of C29. Slide the final tuning dial on the shaft of C29.

f. Check to see that the final tuning inductor L9 is tight against the front stop; that C29 is fully meshed. Then push the final tuning dial very firmly against the spring washer and tighten the set screws with the 0 and 100 dial marks on a line exactly at right angles to the top of the chassis, 0 at the bottom.

g. Remove the knurled nuts from the toggle switches on the front of the chassis.

51. a. Mount the meter, M1 in the front panel using the screws and washers furnished with it. Remove the nuts and washers from the meter studs.

b. Locate the meter shield S6. Install two 9/16 grommets. Mount X27, 3 terminal strip on the outside of the shield using 4-40 screws, shakeproof washers and nuts, the washers and nuts on the outside of the shield. Install a #6 solder terminal under each of the 4-40 nuts.

c. With the terminal strip toward the top of the panel, slide the meter shield over the meter studs. On each of the studs place a flat washer, flat #10 solder terminal, a second flat washer and finally a nut. Turn the solder terminals so they point toward the ends of the panel and tighten the nuts drawing the meter shield contact fingers snug against the panel. Do not tighten the nuts excessively or the meter case may be broken.

d. Wind meter lead chokes L17 and L18, 15 turns, self supporting W2 wire on a pencil or other form approximately 1/4" diameter. Install the filter for the meter leads as follows: Between the left hand meter stud terminal and the corresponding terminal of X27, connect L17, one of the chokes just wound. Between the right hand meter stud and the corresponding terminal of X27, connect L18, the other hand wound choke. Connect C48, .005 mfd. capacitor between the left hand meter stud and corresponding solder terminal under X27. Connect C47, .005 mfd capacitor, between the right hand meter stud and corresponding solder terminal under X27. Solder at meter terminals only. Do not solder the end terminals of X27.

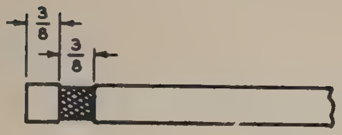
e. Mount the final tuning index plate and escutcheon assembly D2. The maroon escutcheon plate goes over the rectangular hole in the center of the panel, the index plate behind the panel with the indicating mark below. The spacers should be between the panel and the plate. Mount with the screws, washers and nuts furnished.

f. Mount the jewels X13B and X14B in their proper places on the panel with the green jewel toward the left of the panel and secure with the nuts furnished.

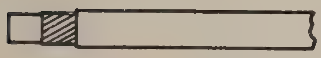
g. Mount a panel bearing D17 on the front panel, in the hole corresponding to the drive shaft of the final amplifier tuning. The threaded portion of

ASSEMBLY DETAILS

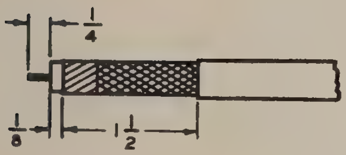
RG-8/U OUTPUT CABLE



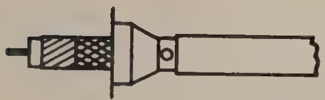
Strip off outer jacket only being careful not to disturb the copper braid.



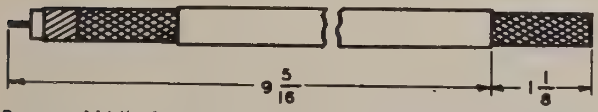
Tin the copper braid with solder, remove all excess solder. After cooling remove end piece of outer jacket and untinned braid, as shown.



Cut outer jacket insulation and center conductor insulation and remove per drawing.

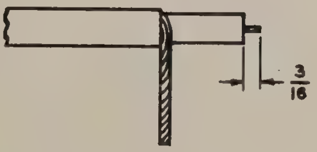


In order to slide hood H1 (Amphenol 83-1H) over the tinned braid it will either be necessary to enlarge the hole in H1 by reaming with the nose of a closed pair of long nosed pliers or carefully filing the tinned braid until it will pass easily thru the hood. After checking to see that H1 now passes over the braid, remove it for the time being.

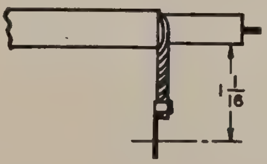


Remove 1⅛″ of outer jacket from the other end of the cable.

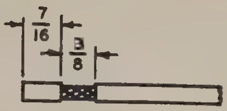
Unbraid the shielding and prepare the center conductor as shown.



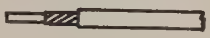
Cut off one of the clamps of one of the heavy No. 10 solder terminals. Clamp the terminal tightly in the exact position shown but do not solder until after the cable has been installed.



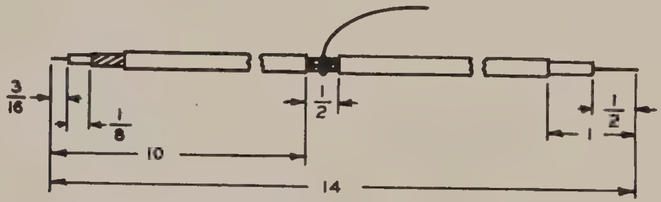
RG-59/U VFO INPUT CABLE



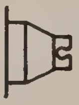
Remove outer jacket as shown.



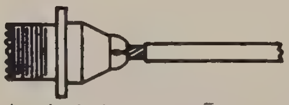
Tin the copper braid with solder. After cooling, remove end piece of outer jacket and untinned braid as shown.



Remove ½″ of outer jacket 10″ from one end as shown and prepare other end by removing 1″ of outer jacket and shield braid, strip ½″ of insulation from center conductor. Solder a 3″ length of No. 20 wire (stripped W2) to the braid where outer jacket was removed.



Using diagonal cutters cut the metal away from the holes in H2 (Amphenol 83-1H) as shown.



Solder the center conductor to the center terminal of one of the 83-1R receptacles. Slide the hood over the RG-59/U cable, bend down to the shield braid and solder. Remove the iron quickly so as not to melt the polyethylene center conductor.

51. g. the bearing should be toward the chassis. Use a shakeproof washer left over from one of the switches, between the mounting nut and the panel. Tighten the bearing only finger tight.

h. Tentatively place the panel over the shafts of the transmitter, shifting shafts as necessary to get them to pass thru the panel holes.

i. Note which, if any, of the panel bearings or switch bushings keep the panel from slipping down over the threads. If necessary, loosen the nuts of the bearings causing the trouble and shift the positions of the components slightly. Push the panel down tight.

j. Fasten the knurled nuts on the switches SW1 and SW2, using fingers only. Secure the panel with 3/8-32 screws on all the bushings extending thru the panel. Be careful not to mar the panel with wrenches.

k. Loosen the dial indicator plate and the final tuning dial and adjust their positions so that the indicator is flush with the dial and clears the dial by about 1/32". Be careful that the nuts do not fall off the indicator plate. A bent piece of #14 wire is probably the best tool to adjust the dial indicator plate position.

l. Mount the microphone connector J1 in the front panel next to the gain control R6, discarding the insulated washers furnished with the connector.

m. Solder the twisted lead of the microphone filter assembly to the center hole in the connector J1. Solder the ground lead and the free lead of C52 (300 mmf. mica) to the ground lug behind J1.

n. Tighten the panel bearing for the final tuning shaft making sure it does not bind. Do not tighten it excessively tight and if binding does occur it can be rectified by moving BFT1 slightly by loosening its mounting screws in the chassis.

o. Slip the split sleeve coupling D18 on the shaft of C18. Slide the 1/4" x $2\frac{1}{4}$" shaft extension D13 into the coupling from the front panel. Center the ends of the shafts in the coupling D18 and tighten.

p. Slip the split sleeve coupling D19 on the shaft of the crystal selector switch SW8. Slip the 1/4" x 5 1/2" shaft extension D11 into the coupling, center the ends of the shafts together and secure.

q. Solder the red meter lead to the terminal of the meter filter terminal board X27 nearest the end of the chassis. Solder the black meter lead to terminal of X27 nearest the output coupling capacitor C30.

r. On each of the dial shafts not equipped with threaded bushings, install a 16.86-1 spring with the points toward the front panel. If necessary, rotate springs to establish good contact with panel. Add a 29.05-1 flat washer to each of these shafts before installing knobs.

52. a. Install the knobs and dials as follows:

Control Function	Dial	Control Position	Dial Reading
Crystal switch SW8	10 - 0	Extreme counter clockwise	0
Buffer tuning C22	0 - 100	Plates meshed	0
Phone-CW switch SW3	Single Mark	Extreme counter clockwise	CW
160 meter switch SW6	Single Mark	Extreme counter clockwise	Out
Gain control R6	10 - 0	Extreme counter clockwise	0
Oscillator tuning C18	100 - 0	Plates meshed	0
Bandswitch SW4	160 - 10	Extreme counter clockwise	160
Excitation control	10 - 0	Extreme counter clockwise	0
Final tuning L9, C29	Spinner	C29 meshed, L9 at stop	0
Coupling SW5	7 - 1	Extreme counter clockwise	1
Fine coupling, C30	100 - 0	At clockwise stop	0
Meter switch SW7	Off - Mod	At counter clockwise stop	Off

53. a. This is the stage now where the testing should be done. Read the Instruction Manual warnings and notices on the first three pages, Theory of Operation and Tuning Details before testing. The following instructions are fairly complete in themselves but familiarity with operating procedure is very helpful. The transmitter should not be placed in the cabinet until after testing thoroughly. First look over the wiring carefully for unsoldered connections, accidental grounds and other mechanical difficulties. A half hour spent now may save hours later.

b. If the tap on the voltage divider R13 has not been positioned to between 1 3/4 and 2 inches from the rear terminal, do so now and check to be sure that the slider is making contact with the resistance element.

c. Install the 5 amp fuse F1 in the fuse holder X16 and with both switches on the front of the panel down (off), plug the line cord into the 115 volt 60 cycle AC line source.

d. Next, with all the tubes out of their sockets, throw the low voltage switch (left hand toggle switch) "on" to determine if line voltage is applied to the primary of T2. This will be evidenced by the green jewel lighting.

e. If no trouble is encountered at this stage, throw the high voltage switch, leaving the low voltage switch "on". The red jewel should light indicating that power is applied to the primary of T1.

f. Turn off the H.V. switch and plug the 5V4G rectifier into socket X10. Check the voltage between ground and the fourth terminal from the front of the chassis on terminal board X20. It should be somewhere around 380 volts positive with respect to ground when the line voltage is 120 volts.

g. Plug the 6AL5/bias rectifier in the socket X11. This should produce a voltage of approximately 70 volts negative with respect to the chassis on the front terminal of terminal board X21. Voltage at the second terminal from the front of the chassis on X21 should be approximately 25 volts. Voltage at the third terminal from the front should be around 40 volts. These readings taken with a 20,000 ohms per volt meter, may be less on a 1,000 ohm per volt meter.

53. h. Set the phone/CW switch on CW. Next, plug the 6AU6 oscillator tube into socket X6 and switch the meter to the "osc" position. Oscillator current without a crystal will be approximately 17 ma to 23 ma. With an active 160, 80 or 40 meter crystal plugged into the crystal socket corresponding to the crystal switch dial, the current should drop markedly to around 9 to 14 ma. The meter reads 25 ma. full scale. Leave the crystal in the circuit. Turn off the low voltage.

i. Next, plug the 6AQ5 buffer into socket X5, set the bandswitch to the setting corresponding with the fundamental frequency of the crystal. Turn on the low voltage. Turn the drive control R25 clockwise about half way. With the meter switch in the "bfr" position, tune the oscillator condenser C18 to the position where the 6AQ5 buffer plate current rises to a peak. This rise in plate current indicates the 6AQ5 in receiving excitation.

j. This step involves application of drive to the 6146 amplifier tubes. Be sure to keep the grid current for the 6146 tubes to 8 ma. or less at all times! Turn off the low voltage, plug the 6AQ5 screen regulator into socket X28, the 6146s into sockets X7 and X17, connect the plate caps, turn the low voltage back on. Tune the buffer condenser C22 for peak grid current turning the drive control R25 counter-clockwise as necessary to keep grid current below 8 ma. The buffer plate current at this point will depend upon its output frequency. At the fundamental frequency of the crystal it may be quite low whereas, if the transmitter is operating on 10 meters with a 40 meter crystal for example, the buffer current will be higher. In the "bfr" position the meter reads 50 ma. full scale.

k. Turn the drive control to the extreme counter clockwise position removing excitation to the 6146's. Plug the 5R4GY rectifiers into their sockets X8 and X9.

l. Turn off the low voltage switch. Turn R30 (on the top of the chassis) to its full clockwise position. Keep the 807 plate caps away from ground. Don't touch them! They will have full plate voltage applied on the next operation. Turn on the low voltage switch and allow time for all the tube cathodes to heat up. Turn the meter switch to the "plt" position, turn on the high voltage switch. The current should be zero and the plate voltage measured at the rear terminal of R13 should be around 700 to 800 volts depending upon the line voltage. NOW BEING MOST CAREFUL BECAUSE FULL PLATE VOLTAGE IS APPLIED, turn R30 counter-clockwise until the amplifier draws a slight amount of current (about 10 ma.).

m. Turn the drive control up until the 6146's draw about 150 ma. plate current (read on the 'plt" position of the meter switch).

n. Tune the final amplifier to resonance starting with the tuning capacitor C29 fully meshed (dial reading 0). This precludes the possibility of tuning the final amplifier to a harmonic. Resonance is the first point where the current dips sharply. (Note: On 10 meters the amplifier cannot be tuned to resonance unless the coarse coupling switch SW7 is on position 7.)

o. Adjust the amplifier for minimum antenna coupling (C30 fully meshed and with the coarse coupling switch on position 1), attach the antenna or preferably

53. o. a 100 watt lamp bulb as a dummy load and retune the amplifier to resonance (minimum plate current). Now load the transmitter by turning the coarse coupling switch to position 2, retune C29 for minimum current, turn the coarse coupling switch to position 3, retune C29 and so on. A point will be reached where the minimum amplifier plate current is now at a somewhat higher level indicating that the amplifier is at least partially loaded. At this point, bring the grid current up to its normal value of 6 ma. The plate current will now be considerably higher. Continue tuning the amplifier as before using SW7 and C30 as a fine coupling control always bringing the amplifier back to resonance with C29 after each adjustment of C30 or SW7. The loaded plate current should not exceed 300 ma. When fully loaded, no matter what the current there should still remain a perceptible difference between the out of resonance plate current and resonant plate current. Do not load beyond the point where a perceptible dip can be obtained. Adjust loading to 230 ma. "plt", 6 ma. grid.

p. Leave exciter tuning and the drive control exactly as they are now set. Turn off both power switches, turn R30 to its full counter-clockwise position. Plug the 807s into sockets X3 and X4 and attach plate caps. Turn on the low voltage switch and by means of the drive control keep the drive at 6 ma. Switch to the phone position, turn on the high voltage switch, readjust grid current for 6 ma., plate current for 230 ma. Switch meter to modulator position, note modulator current and turn off high voltage. Modulator current should be between 70 and 80 ma. If it is less than 70 ma. loosen the slider and move it toward the rear of R13, 1/8" at a time. If greater than 80 ma. move it toward the front. DON'T FORGET TO TURN OFF THE VOLTAGE FOR EACH ADJUSTMENT. After having established the static modulator current between 70 or 80 ma. you are now ready for the final adjustment of R30. With the high voltage off turn R30 to its full clockwise position. Switch the crystal switch to a blank position (no crystal plugged in that particular socket), switch to CW. Turn on the high voltage BE CAREFUL HERE, turn R30 until "plt" current rises perceptibly. Adjust R30 for 10 ma. "plt" current. Switch to the phone position and check the "plt" current. It should be less than 50 ma. This completes adjustment of R13 and R30. They will remain stable over long periods and need only be checked if 807 tubes are changed.

q. Turn off both power switches, switch to CW, switch the crystal selector back to its correct position, turn audio gain control to "0" and plug the 6 6AU6 tubes into sockets X1 and X2. Turn on the low voltage switch and after warmup, the high voltage switch. Adjust the drive, load the amplifier to 230 ma. switch to the phone position.

r. If, with the audio gain control turned to the "0" position a whistle is heard from the modulation transformer or if modulator current is 150 ma. or higher, turn the high voltage off, discharge the high voltage supply by shorting the 807 plate caps to ground, reverse the 807 plate caps.

s. Deleted

t. Attach the microphone to the mike input connector and adjust the audio gain control for 100% modulation (approximately 175 ma. "mod" current peak swing.)

53. u. Before assembling the transmitter in the cabinet, it is a good plan to check it on all bands and become somewhat familiar with its operation.

54. a. Install the Viking II in the cabinet. With the large rectangular cutouts at the bottom, slide the assembly 23.995-1 (back and sides of the cabinet) under the rear edge of the transmitter chassis. The screw holes in the ends of this assembly will line up with the 5 tapped holes at each end of the front panel.

b. Using 5/16" 8-32 binding head screws and #8 shakeproof washers, secure the assembly 23.995-1 to the front panel. Access to the lower screw holes is best obtained by placing the end of the transmitter chassis flush with the edge of the work bench thus permitting you to work from the bottom. If a long screwdriver is used, the blade of which fits the screw slots snugly, then wax or some other material can be used to hold the screws on the driver, greatly simplifying this operation.

c. Using 3/8" #8 threadcutting screws and shakeproof washers, secure the back panel of the cabinet to the rear of the transmitter chassis. The end of one screw will be very close to pin #8 of the 5V4G socket X10. Bend the solder tab of this socket contact straight up and be sure there are no stray strands of wire which can accidentally short to the screw. One of the other screws will touch one of the terminals of the 5R4GY socket nearest the rear of the chassis, however, this terminal is blank and no harm will be done.

d. Using a flat washer under the head of each 1/2" 10-32 screw mount the four rubber feet 22.825 on the bottom plate, securing them with #10 shakeproof washers and 10-32 nuts.

e. Install the bottom plate using 5/16" 8-32 binding head screws and #8 shakeproof washers.

f. With crystals, tubes and tube shields all in places and with plate caps connected on both 6146's and 807's install the top cover 23.993-2. With the folded edge to the rear, slide the lip of the lid between the panel contact springs and the top edge of the panel. Secure the rear of the top cover with three 1/2" 10-32 thumb screws.

This completes assembly of the Viking II transmitter. Detailed operating instructions and servicing data will be found in the companion book "Operating Instructions, Viking II Transmitter".

Wilson Jones

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